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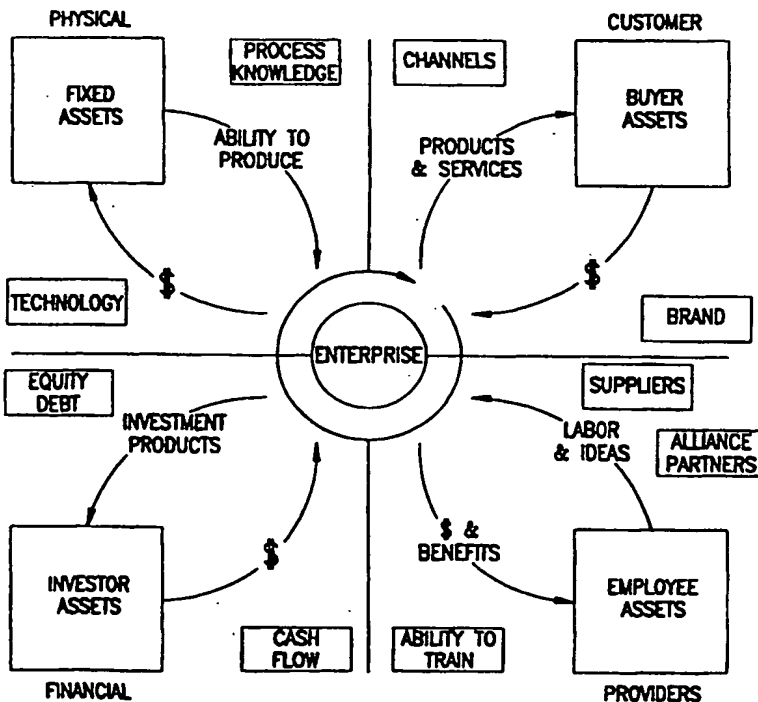
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(54) Title: SYSTEM FOR MODELING, MEASURING, MANAGING, AND DEPICTING THE EFFECTS OF BUSINESS DECISIONS ON MARKET VALUE

## (57) Abstract

The market value of a business depends on many factors: the age and capacity of its factories, the popularity of its brandnames, the ingenuity of its workers, and so forth. These tangible and intangible factors, or assets, reflect that a business has made decisions to invest or allocate its resources in particular ways. In this sense, all business operating decisions, such as hiring or firing employees, selling or buying back stock, buying or selling plants, or spending more on advertising, are investment decisions that affect market value. Based on these insights, the inventors devised a computer system that models the effect of business decisions on the market value of a business. The system classifies assets and other data representative of business decisions into tangible and intangible asset categories and models market value as a function of items in these categories. The system also allows businesses to simulate the effect of their operational decisions on market value, and displays, through unique graphic aids, the relative contribution of the associated assets to that value. Ultimately, the invention provides market-sensitive guidance for making business management decisions that optimize returns and reduce business risk.



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**SYSTEM FOR MODELING, MEASURING, MANAGING, AND DEPICTING  
THE EFFECTS OF BUSINESS DECISIONS ON MARKET VALUE**

Technical Field:

The present invention concerns business information, accounting, and management systems and methods.

Background of Invention:

Business information and accounting systems are typically computer-based systems that assist in the financial operation and management of businesses. These systems facilitate accounting based on generally accepted accounting principles. Implementing these principles entails classifying and reporting financial data as itemized income statements and balance sheets. Income statements report income and expenses of the business, for example, sales revenue and employee wages. Balance sheets, on the other hand, report physical and financial assets and liabilities, such as inventory value, real estate value, bank account balances, and total debt. The difference between total assets and total liabilities on the balance sheet defines the net worth, or book value, of the business. This accounting definition of business value treats financial and tangible assets as the only assets affecting how much a business is actually worth.

However, recent years have seen the emergence of an information economy, in which informational or intellectual business "assets," such as technical and marketing know-how, are eclipsing tangible assets in business importance, particularly in determining the market value of businesses. For evidence, one need only consider the trend toward ever greater market-to-book multiples for businesses listed on public stock exchanges. A market-to-book multiple measures the gap between the book value of a business and the market value of the business. For instance, a market-to-book multiple of five means that the market value, or total stock value of a business, is five times the book value of the business. In other words, the book value of this business underestimates its market value by a factor of five.

To account for this large gap, financial analysts and investors generally view market value as the sum of book value and another plug-in number. This other number, often termed "blue sky" or "good will," is generally assumed to represent the current lump-sum value of income streams, growth potential, and other factors affecting profitability of the business. However, other than this acknowledgment of the difference between what accountants see as valuable in their books and what markets see as valuable in stock prices, there has been little, if any, progress in developing effective ways of measuring and incorporating intangible assets into an overall business accounting system and market valuation technique.

This failure has lead many business investors and lenders to overemphasize tangible assets (such as real estate, plants, and equipment) in evaluating both the growth potential and credit-worthiness of many businesses. This ultimately encourages imprudent loans and investments.

Additionally, many business executives, lacking accurate, comprehensible data on intangible assets and their effects on business success (measured as stock value), fail to effectively understand and manage them and thus to unnecessarily jeopardize shareholder investments and employee livelihoods.

Accordingly, there remains a need for business accounting methods and systems, business valuation methods, and strategic management aids that not only classify and account for intangible assets but provide an effective and convenient framework for modeling and understanding how tangible and intangible assets interact to affect market value.

#### Summary of the Invention:

To address these and other needs, the inventors have devised methods, software, and systems that assist users, such as business executives, to see how market value is created and diluted, to measure the impact of operating decisions on market value, and ultimately to make operating decisions that consistently enhance market value. The original core premise of the invention is that business operating decisions reflect or imply investments into specific categories of assets that in turn govern or affect the market value of a business. In putting the premise to work, the inventors devised the following primary embodiments of the invention.

A first embodiment of the invention classifies business assets and information into tangible and intangible assets. The primary asset categories include physical and financial subcategories, and employee and customer subcategories. These asset categories form an exemplary framework for modeling the market value of a business.

A second embodiment of the invention classifies business assets and information from multiple business entities, including both the business user's company and other companies, according to the physical, financial, employee, and customer categories. Combining the business users information with information about other companies according to the classification framework provides a more accurate model of market value.

A third embodiment of the invention allows the business user to simulate and display the effect of operational decisions on market value. The system uses a number of advanced mathematical techniques such as regression analysis, and other analytical devices such as neural network technology and system dynamics.

A fourth embodiment of the invention allows a business to calibrate the model based on the effect of similar investments in other companies. Consequently, this recalibration allows the business user to measure its operational and investment decisions based on anticipated market value responses and to integrate this information into its decision making.

A fifth embodiment of the invention automates the transfer of information from a business accounting system into the market-value model, allowing regular updates of projected market performance based on daily, weekly, or monthly accounting and market data. In addition, these

market projections can be integrated into the decision making process of a business to allow for continual tuning of business operations to maximize market value.

A sixth embodiment of the invention provides a visualization system which not only illustrates market value components based on the asset categories and overall market value but also their trajectories over time. The trajectories are particularly useful for charting a history of operating decisions and correlating these decisions or changes in market value to events internal and external to a business. Several business can be tracked for comparative strategic analysis. Thus, this embodiment provides insights into how internal and external events affect market value.

Ultimately, these and other embodiments of the invention allow business decision makers to project how operating decisions, such as decisions to hire or fire workers or to buy equipment or to back buy stock or to spend more on advertising, are likely to affect market value. In short, these and other embodiments provide market-sensitive guidance for making business management decisions.

Brief Description of the Drawings:

- Figure 1 is a block diagram of a business information and management system embodying the present invention.
- Figure 2A is a block diagram of an asset categorization scheme including tangible and intangible assets of an operating business.
- Figure 2B is a block diagram of another asset categorization scheme including tangible and intangible assets of an operating business.
- Figure 3 is a diagram illustrating layers of the asset categorization scheme of Figure 2A.
- Figures 4A and 4B are block diagrams illustrating acquisition and staging of data from external sources.
- Figure 5 is a block diagram of a market valuation engine based on categorized assets.
- Figure 6 is a block diagram of a high-level stock and flow of the engine of Figure 5.
- Figure 7A is a diagram showing details of the physical portion of the exemplary high-level stock and flow diagram of the engine of Figure 5.
- Figure 7B is a diagram showing details of the financial portion of the high-level stock and flow diagram of the engine of Figure 5.
- Figure 7C is a diagram showing details of the employee portion of the high-level stock and flow diagram of the engine of Figure 5.
- Figure 7D is a diagram showing details of the customer portion of the high-level stock and flow diagram of the engine of Figure 5.
- Figure 8 is a listing of simultaneous equations which are the mathematical equivalent of the stock-and-flow diagram of Figure 7.
- Figure 9 is a facsimile of a unique tetrahedral graphic aid showing the relative contribution of physical, financial, employee, and customer assets to the market value of a

- of publicly traded companies.
- Figure 10 is a facsimile of a unique tetrahedral graphic aid showing the relative contribution of physical, financial, employee, and customer assets to the market value of clusters of publicly traded companies having similar relative asset contributions to market value.
- Figure 11 is a facsimile illustrating rotation of the unique tetrahedral graphic aid of Figure 10 about several of its axes.
- Figure 12 is a block diagram of a heat map graphic aid used to visualize the contribution of physical, financial, employee, and customer assets to the market value of clusters of publicly traded companies having similar relative asset contributions to market value.
- Figure 13 is a block diagram of the heat map graphic aid of Figure 12 showing members of a selected cluster, a first pie chart representing the average contribution of asset categories to market valuation of the selected cluster and a second pie chart showing the asset-category contributions for a particular selected business within the cluster.
- Figure 14 is a facsimile of several heat map graphic aids illustrating a historical asset-contribution tracking feature of the heat map graphic aid of Figures 12 and 13.
- Figures 15-23 are facsimiles of graphic aids incorporating teachings of the present invention.
- Figure 24 is a diagram showing a side-by-side comparison of conventional book value and market value, both depicted according to teachings of the present invention.
- Figure 25 is a diagram illustrating the difference between a book value of a software company and its market value.
- Figure 26 is a set of graphic aids depicting market value of typical businesses in various industries, according to teachings of the present invention.

#### Detailed Description of the Invention:

The following detailed description, which references and incorporates the Figures 1-26, describes and illustrates specific embodiments of the invention. These embodiments, offered not to limit but only to exemplify and teach the invention, are shown and described in sufficient detail to enable those skilled in the art to implement or practice the invention. Thus, where appropriate to avoid obscuring the invention, the description may omit certain information known to those of skill in the art. The description includes the following eight sections:

- Section 1 describes an exemplary computer system which is linked, or networked, with several sources of business information.
- Section 2 describes an exemplary asset (or business data) classification schemes which provides a foundation for modeling market value and the effect of business decisions on market value.

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|-----------|---|
| Section 3 | describes exemplary market value models and systems dynamics simulations for dissecting the components of market value and estimating the effect of business operating decisions on market value. |
| Section 4 | describes several unique visual displays based on a four- and five-asset classification schemes.  |
| Section 5 | is a glossary which defines several terms important to the description.   |
| Section 6 | includes appendices A, B, C which provide details of various actual or potential implementations, or embodiments, of the invention.   |
| Section 7 | is a conclusion which highlights some functions and benefits of exemplary embodiments of the invention.   |

### Section 1--- Exemplary Computer System

Figure 1 shows an exemplary networked computer system 110 comprising a standard personal computer 112 coupled via a local area network to a server computer 114. Though not shown explicitly, computers 110 and 112 include processors which cooperate with electronic, magnetic, optical memories, and/or other information storage devices, to execute stored computer programs and related methods of the invention.

In addition, computer 112 includes or accesses functional block 115 which itself includes a content block 115a and an analytic block 115b. These blocks include computer programs, data, and data structures that enable the system to model and estimate market valuations or direction of market-value changes. More specifically, content block 115a includes news and contextual analysis data as well as accounting data and other information indicative or representative of business operating decisions. Functional block 115 is shown separate from server 114 and computer 112 to represent that the functions can be implemented on a computer singularly or in a distributed manner.

Server 114 is also coupled to a host system 116 residing at a customer site and having access to an associated customer database 117 which contains accounting data and other data indicative or representative of business operating decisions. Server 114 is further coupled to a data warehouse 120 which includes one or more data storage and management devices. Such devices comprise both a customer data warehouse and an extracted-information-provider-data warehouse.

Data warehouse 120, in the exemplary embodiment, comprises one or more computer systems having network connection capabilities, allowing it to obtain further information from one or more external information providers through a wide-area network 130. Wide-area network 130 comprises one or more communication mediums, such as fiber optics, Internet-based networks, satellite communications, and various other high bandwidth communication devices, such as T1 and T3 lines.

Coupled to wide-area network 130 is a data collection and analysis system 140 for collecting

business items and other business operational decision information related to internal and external businesses. Collection system 140 interfaces with several external sources of business information, compiling it in storage devices 142 and a data warehouse 144. Within collection system 140, database 146 collects customer raw data related to operating decisions of a customer business. The customer raw data includes business information related to four categories of assets: physical assets, financial assets, employee assets, and customer assets. (Some embodiments further include analogous mechanisms and system for collecting information related to other categories of assets, such as organizational assets.)

In the exemplary embodiment, collection system 140 resides at a provider site, that is, with an entity that advises businesses in making business decisions. As such, system 140 is a logical collection point for business information from external providers. These external providers include a financial-information provider 150, an employee-information provider 152, a customer-information provider 154, and a physical-information provider 156. Although the exemplary embodiment depicts a single-entity provider for each of the four categories, other embodiments of the invention rely on one or more providers for each category and/or several providers for one or more of the information categories. Collection system 140 further comprises a functional block 148 which mirrors or corresponds to functional block 115. Block 148 evidences the notion that such functionality can reside entirely or partially within collection system 140 as well as within computer 112.

## Section 2 --- Exemplary Asset Classification Schemes

Figure 2A shows a unique asset (or business-information) classification scheme 210 for use with system 110. Classification scheme 210 classifies both tangible and intangible assets into a four-class system including at least two classes for tangible assets and at least two classes for intangible assets. More particularly, the scheme classifies tangible assets into respective physical and financial categories 212 and 214, and intangible assets into respective employee and customer categories 216 and 218.

Examples of physical assets include inventory, production capacity, and equipment, and examples of financial assets include operating capital, cash flow and investor return. Examples of customer assets are buyers or customers, channels, and brand, and examples of employee or provider assets are organization capital, human capital and supply chain. Detailed definitions of these categories (as well as other terms) are included in the glossary section of this description. Additionally, to further illustrate use of this exemplary classification system, the inventors provide a table in Appendix A which organizes a number of data items, available in the FAME database, according to the classification system. Appendix A also includes a catalog of business data which can be classified according to the classification scheme.

Physical and financial assets have been valued and reported on balance sheets according to ages-old accounting principles and tax rules. However, previous accounting systems fail to provide a systemic



methodology for assessing the market value of tangible assets, relying instead of their depreciated values. Moreover, previous accounting systems have never provided a systemic classification scheme for intangible assets nor any systemic methodology for valuing these assets with any degree of confidence. Indeed, accounting systems generally only account for intangibles after a business is bought or sold, to explain the entire difference between book value and sale price of the business. In Sections 3 and 4, the inventors describe an exemplary market-oriented approach to valuing both tangible and intangible assets.

Figure 2B shows another unique asset (or business-information) classification scheme 220, similar but distinct from that shown in Figure 2A. Classification scheme 220 includes categories for tangible and intangible assets (at least two for tangible assets and at least two classes for intangible assets) as well as an interrelational, binding, or hub, category, which the inventors call an organizational (and structural) asset category.

More particularly, scheme 220 classifies tangible assets into a physical category 222 and financial category 224, and intangible assets into respective employee, customer, and organizational asset categories 226, 227, and 228. Physical asset category 222 includes property, plant, equipment and inventory. Financial asset category 224 includes cash and equivalents, short- and long-term investments, accounts receivable, debt and equity, and prepaids and other. Employee (or human) asset category 226 includes employees, suppliers, and partners. Customer asset category 227 includes customers, distribution channels, and alliances.

Organization asset category 228 includes organizational and structural asset sub-categories. The organizational sub-category includes leadership (the guiding role of management to direct, command, and influence an organization), strategy (the organization's business and operational plans for attaining the organization's objective), knowledge (the individual and collective familiarity, awareness or competencies acquired through experience or study), and values (the organization's principles, standards or qualities regarded as worthwhile or desirable).

The structural sub-category of organizational assets includes reputation (the belief about the organization, its brand and its products or services and brands), innovation (the expertise, resources, methodology, creativity, discipline, risk-taking, planning, timelines, budgeting, that are directly or indirectly employed in the creation of the organization's processes and product and service offerings), systems (the organization's set of interrelated, interacting or interdependent mechanical, electrical, electronic or logical components and rules), and processes (the organization's series of operations, methods, actions, tasks or functions).

Figure 3 shows a chart 310 which embodies the premise that the market value of a business depends on assets in the four asset categories shown in Figure 2A, namely physical, financial, employee, and customer. Chart 310 also shows that the assets in the categories can be measured directly or indirectly using specific business information. For example, chart 310 shows that the customer categories includes customers, brands, and channels, and that these assets can be measured, for example, using data

representative or indicative of the number of active customers, propensity of customers to purchase from the business, market share of the business, propensity of the business to leverage outbound partners, propensity of the business to leverage knowledge of customers; and the strength of one or more brands (trademarks.)

Some of these, for example the propensity and strength factors, can be based on actual statistical measures or on crude relative rankings. Such measures (or proxies) are described below in conjunction with an analytic engine which incorporates these measures to determine the effect of operational decisions as categorical investments or divestments and the effect of implied investment or divestment decisions on market value.

Appendix B includes a questionnaire and associated chart for implementing a relative scheme not only to assess or appraise the effective contribution of assets or the asset categories to market value, but also to comparatively analyze the relative effectiveness of one company's asset effectiveness to that of another. This questionnaire and charting scheme can be implemented with or without a computer.

Figures 4A and 4B show a data collection system 410 facilitating the collection of information for use by a user executing the Appendix B procedure or by a computer implementing an automated modeling or simulation process as described below. Data collection system 410 interfaces with external data sources comprising a financial-information provider 412, a customer-information provider 414, a physical-information provider 416, and a labor-information provider 418 to provide batch transfer via respective data transfer devices 422, 424, 426 and 428 to respective staging-area storage devices 432, 434, 436, and 438.

The staging-area storage devices perform data validation, including, for example, clearing, business-rules checking, and format checking and correcting. From the staging areas, data, now termed operational data, passes to operational data storage devices 442, 444, 446 and 448. The data is then subject to an aggregation and derivation process, which aggregates the data, for example, according to business name, industry, total revenues, size, or so forth, and which derives other proxy or derivative data. For example, one derivation, in the exemplary embodiment, derives total market value from total number of shares outstanding and a share price.

After the aggregation-derivation process, aggregated information passes to a financial data warehouse 452, a customer data warehouse 454, a physical data warehouse 456, and labor (employee or provider) data warehouse 458. The data of the financial, customer, physical, and employee data warehouses then passes to respective pairs of data marts 462a and 462b, 464a and 464b, 466a and 466b, and 468a and 468b. The data marts are organized optionally as pairs in the exemplary embodiment for enhanced bandwidth and redundancy.

## Section 3 --- Market Value Modeling and Simulation

Figure 5 shows an exemplary market-valuation engine 510 which is coupled to data collection system 410 via an information interchange block 512. Market-valuation engine 510 uses the exemplary asset-classification scheme of Figure 2A or Figure 2B as a basis for developing strategically useful models of how business items affect or potentially affect the market value of a business. (The invention, however, is not limited to the particular assets or categories of this scheme.)

In some embodiments, market-valuation engine 510 exists within one or more business consulting centers within a unique business consulting system. The consulting centers collect and processes data in accord with system similar to those in Figures 1 and 4. Two or more business client computer systems couple to each consulting system via a wired or wireless public or private local- or wide-area network, such as the Internet. The businesses communicate relevant business data and advise requests to the business consulting center and the consulting center processes this data along with other relevant market and industry specific data to provide global, regional, industry market value projections and other indications, assessments, and appraisals in accord with various aspects of the present invention. The business can then use these to guide their business decisions. The exemplary engine implements the following six exemplary market-valuation models.

A first embodiment of the model views market value as a function of tangible and intangible business items. This is expressed in mathematical functional notation as

$$MV = f(T, I) \quad \text{Eq. 1}$$

where MV denotes market value; T denotes one or more tangible business items; and I denotes one or more intangible business items. When more than one business item are used they are aggregated in some fashion. (This generic formulation encompasses the representation of market value as the sum of book value, that is, tangible assets, and a gap-filling number representative of goodwill).

In a second embodiment, the inventors model the market value MV of a business as

$$MV = f(K_t T, K_i I) \quad \text{Eq. 2}$$

where  $K_t$  and  $K_i$  are market-oriented weighting factors. The actual model could be an additive, multiplicative, or mathematical combination. A particular implementation of this model views the market value MV as a linear combination of the  $K_t T$  and  $K_i I$  constituents, or in mathematical terms as

$$MV = K_t T + K_i I + K \quad \text{Eq. 3}$$

where K is a constant. To distinguish from the conventional approach of filling in a gap-filling number representative of cumulative goodwill,  $K_t$  and  $K_i$  are not equal to positive one and/or K is non-zero.

Although the invention is not limited to any particular technique for calculating or selecting the weighting factors or the constant K, the inventors use regression analysis techniques, historical market data for a given business or groups businesses, and actual historical business data for tangible variable T and intangible variable I. (Regression analysis refers to a well-known mathematical methodology of

relating observed variations in a quantity or variable to variations in other quantities or variables. One specific type used in the exemplary embodiment is least-mean-squares regression analysis.) The market data can be accessed or generated in any number of ways, for example, via a computer link to an on-line database.

After determination or selection of the model parameters, the model can be used to project or estimate a new market value based on investment or divestment in the tangible or intangible business item (which is representative of an asset or operational decision). For example, one can double the value of investment into both of the tangible and intangible business assets and compute the new market value based on the determined or selected modeling parameters.

Moreover, one can also develop a market value trajectory for a given tangible or intangible investment or divestment strategy implemented over time by computing new market values for a series of different tangible or intangible business items representative of the temporal strategy. Similarly, one can also randomly dither or otherwise temporally vary one or more of the model parameters  $K_1$ ,  $K_2$ , and  $K_3$ . Graphs of these market value trajectories can easily be developed using any number of original or off-the-shelf computer software tools. For example, the inventors use ITHINK<sup>TM</sup> visual dynamics and visual simulation software and a conventional personal computer. ITHINK software is available from High Performance Systems, Inc. of New Hampshire.

In a fourth embodiment, the inventors model the market value MV of a business as a function of physical, financial, employee, and customer business items. Mathematically this is expressed as

$$MV = f(P, F, E, C) \quad \text{Eq. 4}$$

where P denotes a single or aggregate business item from the physical asset category, F denotes a single or aggregate business item from the financial asset category E denotes an a single or aggregate business item from the employee asset category, and C denotes a single or aggregate business item from the customer asset category.

In a fifth embodiment, the inventors model the market value MV of a business as

$$MV = f(K_1F, K_2P, K_3E, K_4C) \quad \text{Eq. 5}$$

where  $K_1$  -  $K_4$  are weighting factors. A particular implementation of this model treats the market value MV as a linear combination of these four constituents, or mathematically as

$$MV = K_1F + K_2P + K_3E + K_4C + K \quad \text{Eq. 6}$$

where K is a constant. As in the previous model, one can simply select arbitrary values for the K parameters or use conventional regression analysis to determine values based on simulated or actual market value data for one or more businesses.

After determination or selection of the model parameters, the model can be used to project or estimate a new market value based on investment or divestment in any one or more of the asset categories as represented by its business item. Moreover, one can also develop a market value trajectory for a given investment or divestment strategy for each category of the business items. Similarly, one can also

randomly dither or otherwise temporally vary one or more of the model parameters and graph market value trajectories.

The following table summarizes the business items employed in several exemplary implementations of not only this fifth embodiment but also one or more of the earlier embodiments.

Exemplary Models for Market Value				
MV Market Value	F Financial	P Physical	E Employee	C Customer
MV	CASHST	PPGROSS	EMPLOYEE	SGAEXP
MV	ASSETS - PPGROSS	PPGROSS	EMPLOYEE	SGAEXP
MV	ASSETS- PPLANT - INTANG	PPGROSS	EMPLOYEE	SGAEXP

In the table, ASSETS denotes value of total assets from a balance sheet; CASHST denotes value of cash and short-term investments; and PPLANT denotes net total property, plants, and equipment. Additionally, EMPLOYEE denotes the number of employees; SGAEXP denotes selling, general, and administrative (SG&A) expenses; and INTANG is value of intangibles. Although not shown explicitly in the models of this table, the exemplary embodiment normalizes each model by total sales; in other words, each term in the model is divided by a business item representing total sales of a company to remove or at least ameliorate factors related to size of a business. Equation 7 illustrates how the business items in the Table, specifically its first row, can be integrated into the fifth embodiment:

$$MV = K_1 CASHST + K_2 PPGROSS + K_3 EMPLOYEE + K_4 SGAEXP + K \quad \text{Eq.7}$$

Other embodiments use price-to-earnings ratio as the market value parameter for the regression analysis. In these instances, one can exclude companies with zero or negative earnings, or companies from the best and/or worst deciles of price-to-earnings performance. Also, one can restrict the underlying data for the regression analysis to companies reporting a minimum number of years to avoid or reduce the data volatility that start-up companies could induce. For example, the exemplary embodiment rejects data from companies that are less than three years old.

One exemplary set of software tools for performing the regression analysis is the FAME 7.7 software for Windows NT 4.0; and another is FAMES native 4GL software. An exemplary source for data on which to base the regression analysis is Standard & Poors Compustat annual fundamentals, stored in FAME databases. The Compustat database includes income statement, balance sheet, and cash flow data items for more than 10,000 companies, with annual history dating from 1978. The databases offer both a time series and a cross-sectional perspective of the economy, facilitating both historical and

snapshot (at a given year end) regression analysis. (See Appendix A for a catalog of data items in this database.) The invention, however, is not limited to any particular genus or species of database.

The previous models are conceptually quite simple; however, the inventors appreciate that in reality businesses comprise interdependent relationships not only between one business asset (or item) category and another business asset category, for example, the financial and customer categories, but also among two or more items of a given asset category, such as a decision to sell information about customers and the number of total customers. The interactions or interdependencies of these elements create positive and negative feedback relationships which are not immediately apparent in the models represented in equations 1-7. Accordingly, in a sixth embodiment, the inventors model market value using conventional systems dynamics methodologies and a set of twelve business items representative of the four (PFEC) categories.

Figure 6 shows a simplified stock-and-flow diagram which defines the form of a computer-implemented systems dynamics model of the engine of Figure 5. The exemplary embodiment uses the concepts and tools of system dynamics to articulate and exercise the following four key principles:

1. Firms, or businesses, transact in four distinct, but interdependent, markets (or asset categories) and need to manage those interactions in strategic concert to maximize value.
2. The material transactions or operational decisions, of everyday business have coincident "shadow" transactions of information that create scalable, valuable information assets.
3. The processes that create and leverage different assets are interdependent and operate with differing "rhythms" that, depending on how they are managed, can increase or reduce market value.
4. Coupling these insights with market-valuation models, such as system-dynamics-based tools, allows decision makers to manage for, or "engineer," value by strategically investing in, and managing, their portfolio of tangible and intangible assets.

The exemplary embodiment is further grounded in the assumption that firms transact in the four distinct, but interdependent, asset markets discussed earlier: Financial; Physical; Employee (Provider); and Customer. In each market category, the firm engages in a series of two-way exchanges to secure and leverage the assets that determine its market value.

One at a time, this section explains the principle of multi-market exchange by first examining the four market sections depicted in Figure 6 and then explains, at least in part, their cross-market interdependencies. In the financial market, the key relationship is that of the firm to its investor. This two-way relationship hinges on a firm's ability to attract capital from its investors, a subset of the investing public. The investors provide the firm cash to expand, and in return, the firm offers financial investment products, debt, equity, or some combination in between to investors. At least two enabling factors affect the efficiency of this relationship: the quality and convenience of the cash flows the firm produces. Properly regulated, these factors enhance the efficiency and effectiveness of capital flows into

and out of the firm.

Figure 6 also shows that a business interacts with a physical market to regulate its physical asset holdings. The business, after acquiring capital from investors, traditionally has entered into a relationship with one or more natural resource markets to acquire or build physical assets. In its two-way relationship with this asset market, the business ordinarily exchanges dollars, or capital, for fixed physical assets, which supports its capacity to produce goods and services. Enabling factors, which are often reflected in specific business operating decisions and related information, in this relationship are based upon technology and process knowledge. New technology allows for a more efficient use of dollars throughout the business, and process knowledge, on the other hand, allows the business to use all assets more effectively, for example, to reduce production costs and/or to increase production rates.

Figure 6 also shows a third important relationship, the two-way relationship of a business to its employees or providers. The employees provide labor, time and ideas in exchange for dollars and benefits. These include not only the traditional benefits, such as health insurance, paid vacation, and so forth, but also benefits such as training and networking. These benefits in turn enable the enterprise to be more effective in the marketplace. Enablers for this relationship include the firm's ability to train new employees, and the size of the its supplier network. The supplier network includes both the suppliers to the firm and the firm's alliance partners. These relationships enable it to draw upon the contacts of a larger network, which in turn facilitates finding and hiring new employees. Likewise, potential employees will be attracted to firms that provide a large network of contacts. This becomes a rich source of both new ideas and future leads and contacts.

The last important two-way relationship shown in Figure 6 is the customer-to-business relationship. Traditionally, the buyers have provided dollars to the enterprise in exchange for products and services. One enabling factor that facilitates the relationship is strong brand reputation or product quality. Another concerns the channels of product or service distribution.

Figures 7A-7D shows interactions among the different asset markets and categories, implicit to the elementary stock-and-flow diagram of Figure 6. More specifically, Figures 7A-7D shows a detailed stock-and-flow model 510 which describes mathematical dependencies of various business items in the financial, physical, employee, and customer asset categories. The nomenclature or vocabulary of stocks and flows is known; so a detailed explanation is not included here. The diagram graphically represents a set of simultaneous equations, with variables in one equation affecting variables in other equations.

Figure 8, the mathematical equivalent of Figure 7, shows some of these equations. These equations are implemented by a systems dynamics module of engine 510 (shown in Figure 5.) The exemplary embodiment of the invention implements this model using ITHINK visualization and simulation software. However, the invention is not limited to this genus or species of software platform; indeed, other embodiments of the invention can be developed on other commercial systems, dynamics software platforms, or as specific PC or web-server-based application programs for a variety of operating

system environments. The definitions of the business items and derivative variables of these equations as well as explanatory comments for the equations are provided in Appendix C. Some embodiments of the invention use the weighting factors or coefficients from equations 1-7 for a given business or group of businesses or analogous information to further inform and enhance accuracy of the system dynamics model. In general, this would entail adjusting the magnitude and/or sign of one or more coefficients of the model.

#### Section 4 --- Visual Displays Based on Asset Classification

Figures 9-25 show various visual representations of business valuation information produced by the engine of Figure 5. In particular, Figure 9 shows a unique two-dimensional rendering of tetrahedral graphic aid 910 showing the relative contribution of physical, financial, employee, and customer assets to the market value of a number of publicly traded companies. The exemplary embodiment represents market value using return on investment over a one-, five-, or ten-year period.

More particularly, graphic aid 910 includes four independent axes: a physical axis, a financial axis, an employee axis, and a customer axis. Each axis has a scale ranging from zero at its intersection with the other axes to a maximum value. Although not visible in the black-and-white figure, each point on the graphic aid can have an associated color based on the market value of its associated publicly traded company. In the exemplary embodiment, engine 510 uses equation 7 and regression analysis techniques to model the market value of each of a number of publicly traded companies for a particular year. These weighting factors  $K_1 - K_4$  are then taken as indicators of the relative contribution of each asset to the market value and plotted on the four tetrahedral axes. One technique for rendering the four-dimensional plot in two dimensions is to compute the average of specific pairs of the four weighting factors and to thus reduce the four tetrahedral coordinates to two planar coordinates.

Figure 10 shows an exemplary three-dimensional rendering of a unique tetrahedral graphic aid 1010 showing the relative contribution of physical, financial, employee, and customer assets to the market value of clusters of publicly traded companies having similar relative asset contributions to market value. Neural network technologies are employed by engine 510 to determine clustering of the weighting coefficients. Moreover, although not shown, this embodiment can display one or more company names next to their associated clusters

Figure 11 shows rotation of the unique four-dimensional tetrahedral graphic aid of Figure 10. Through a graphical user interface to engine 510, a user interacting with the tetrahedron rotates it to gain additional insight into the relative value contribution of each asset on the market value of a cluster of companies. Though not visible in Figures 10 and 11, the exemplary embodiment provides color coding of the points to indicate relative or absolute market value of the cluster. Individual cluster metrics,



statistics, and member businesses can be accessed by "double-clicking" on a particular cluster.

Figure 12 shows an exemplary heat map graphic aid 1210 which indicates the relative contribution of physical, financial, employee, and customer assets to the market value of clusters of publicly traded companies having similar relative asset contributions to market value. More specifically, heat map 1210 in this embodiment includes a ten-by-ten grid or matrix of squares, with the position of each square representing a particular combination of weighting factor ranges. The correlation of ranges to square position is based on a four-axes arrangement similar to that shown in Figure 9. In one sense, heat map 1210 is a "smeared" and "flattened" version of the tetrahedral graphic aid shown in Figure 10.

Each square has a color and/or tone indicating the relative market value of its associated cluster of companies or that it has no associated cluster of companies. With a graphical user interface, one can select one of the squares to view (or to otherwise analyze or direct computer operations on) the members of its associated cluster. Additionally, once a square has been selected to reveal the constituent firms of its associated cluster, the system allows one to select one or more of the constituent firms and to view corresponding pie charts that show relative contribution of the selected firm's physical, financial, employee, and customer assets to its market value.

This feature is illustrated particularly in Figure 13, which shows a pie chart for a selected company below a pie chart representing the average distribution of market value for members of the selected cluster. However, other embodiments permit a side-by-side numeric as well as pie chart comparisons. The exemplary embodiment also allows one to view the relative contribution of each asset category using unique aids or displays like those depicted in Figures 15-25.

Another feature not explicitly shown is that, again with the aid of a graphical user interface, one can invoke a three-dimensional rendering of the heat map that shows the relative market values of each square of the map, which in essence is a "city scape" view of the map. Market value components, for example, the physical or customer components, can be similarly viewed.

Figure 14 illustrates a strategic tracking feature of heat map graphic aid 1210. More precisely, the heat map (and also the tetrahedral graphic aid) can be used to track the changes in the weighting factors for one or more selected companies. In doing so, the system correlates each set of weighting factors for a time-specific market value to a position on the heat map and marks the position, thereby creating a trail showing to some degree the strategic operating decisions of a firm, particularly those strongly affecting its physical, financial, employee, and customer assets. Figure 14 shows the trail as a dashed line.

In the exemplary embodiment, a user can select a point on the trail to determine not only the associated time and weighting factor values, but also to direct the system to correlate the point with relevant archival accounting data or news concerning the company, its industry, or the economy in general. Further external factors are also available for analysis as potentially affecting the course of the

asset values. Thus, this tracking and historical data correlation feature allows one greater insight into the strategic thinking and operational behavior of any number of publicly traded companies.

Figures 15-26 show other exemplary graphic aids (or displays) in accord with the invention. These graphic aids, which in some embodiments also serve as graphical-user interfaces to accounting or business data derived and/or organized in accord with the invention, rely on color (or other indicia) and spatial arrangement to depict an economic position or market value of a business. (In some embodiments the value and thus the area of each component are based not only on business data representative of investments in each of the categories but also on regression coefficients or weights indicative of the contribution of each category of assets to the total market value. Thus, as new assets are added to or subtracted from a category, the market value and the regions affected by the addition or subtraction will illustrate the change through both a change in the affected category and in the total market value).

The exemplary embodiment decomposes market value into five categories: Financial (F), Physical (P), Customer (C), Employee (E), and Organization (O). Accordingly, each exemplary display includes up to five regions, with each region having a color or other indicia and position (relative to the other regions) which identify its associated asset category and an area or size related to the actual or estimated contribution of the associated asset category to the market value of the business. The actual or estimated contribution of each asset category is determined as described above. The total area of the aid is substantially proportional in actual and/or apparent area to the market value of the business.

To facilitate consistent use and comprehension of the aids, the exemplary embodiments provides each category with a consistent position within the display. Moreover, to facilitate comprehension of the displays lacking one or more of regions, the exemplary embodiment in instances where one or more categories lack a region in the display, each category has a token place-holder in the display. The token placeholder is an icon, for example, a circle filled in with the color (and/or other indicia) representing the associated asset category. Some embodiments, add a mnemonic such as alphanumeric character to the circle to further aid comprehension. In particular, Figure 15 shows a graphic aid or display template 1500 which has a generally square shape. Aid 1500 has an outer perimeter or periphery 1502 which defines an area representing a market value of a business. Five asset regions 1510, 1520, 1530, 1540, and 1550, one for each of the five exemplary asset categories, are within perimeter 1502. Each of the five asset regions has an associated asset category and an area related to the contribution of its asset category to the market value. Each asset region also has a distinctive color (and/or other indicia, such as cross-hatching or other pattern) and position relative to the other regions to identify its associated asset category.

Regions 1510, 1520, 1530, 1540, and 1550 are associated with respective asset-category icons (or points of origin) 1512, 1522, 1532, 1542, and 1552, which not only aid in identifying the asset category associated with each region, but also function as placeholders for categories with zero or negative contributions to the market value. The exemplary icons are equi-sized circles filled in with the

color of the associated asset category. In some embodiments, the icons are incongruent and/or include mnemonics or alphanumeric characters to facilitate identification of the associated categories. The table below identifies an exemplary arrangement and color coding of the regions.

Asset category	Color	Position
Financial (F)	Green	Lower left corner
Physical (P)	Red	Upper left corner
Customer (C)	Yellow	Upper right corner
Employee (E)	Blue	Lower right corner
Organization (O)	Purple	Center

In Figure 15, each of the five asset categories is shown as contributing one-fifth, or 20 percent, of the total market value. In this rendering, the angle between the sides of the perimeter 1502 and those of region 1550 is 45°. The relationship between  $x$  and  $y$  is given by the formula,  $x^2 = 5y^2$ , where  $x$  denotes the length of the sides of the outer square and  $y$  denotes the length of the sides of the inner square, or region 1550. Thus, assuming a strict direct proportionality, the market value is five times the value of the assets associated with asset-region 1550, the center asset region. Moreover, the total visible area of each region is equal.

Other embodiments allow for overlapping of regions. Which can mean, for the equi-contribution example, that  $y=0.5x$ . In other words, region 1550 overlaps a portion of each of the other four other regions, so that only three-fourths of the other four regions is visible.

The market value display in Figure 15 can be viewed as recording:

- I an equity subscription comprising assets in each asset category with the same monetary value.
- II an investment of equal amounts of financial assets to acquire assets in each asset category.
- III the creation of equal amounts of value in each asset category.
- IV the reduction of equal amounts of value in each asset category.
- V the realization of equal amounts of financial assets from each asset category.
- VI the exchange of equal amounts of assets from each asset category for non-Financial assets.
- VII the distribution of equal amounts of assets from each asset category.
- VIII the attribution in an equity exchange of equal amounts of value to each underlying asset category.

When the contributions of each asset-category to the market value are unequal, as they will be in most instances, the exemplary embodiments uses the following rules to render a display depicting the market value:

1. Render the total market value using a first (or outer) square with side length  $x$ .
2. Determine relative contribution of the asset category associated with region 1550 (the center asset category) to the total market value.
3. If its contribution is less than one-half the total market value, render the center asset category as a square of appropriate color and proportional area canted at 45 degrees relative to the first square. Note that if its contribution is 100 percent, then the square will be coincident with the first square. Figure 16 illustrates this situation, with icons 1512, 1522, 1532, and 1542 holding places for the other non-contributing asset-categories. (Other embodiments present this center category as another quadrilateral or as some other regular or irregular geometric shape.)
4. If the center asset category was rendered according to rule 3, render the other four asset regions such that:
  - a) the area of each region, for example, financial, physical, customer, and employee asset regions, is actually or apparently proportional to its respective positive value and connects with its respective icon (points of origin); and
  - b) any border between regions 1510 and 1540 (P and F) or between regions 1520 and 1530 (C and E) is horizontal and any border between regions 1510 and 1520 (P and C) or between regions 1530 and 1540 (E and F) is vertical.

Figures 17-19 illustrate application of rule 4. Figure 17 shows asset regions 1520 and 1530 as making no contribution to the market value, regions 1510 and 1540 as both making 30% contributions, and center region 1550 as making a 40% contribution. Figure 18 shows asset regions 1510 and 1540 as making 5% contributions to the market value, regions 1520 and 1530 as both making 40% contributions, and center region 1550 as making a 10% contribution. Figure 19 shows asset regions 1510 and 1530 as making 40% contribution to the market value, regions 1520 and 1540 as both making 5% contributions, and center region 1550 as making a 10% contribution.

5. Render the center asset category as a regular or irregular octagon of proportional area and appropriate color, if its contribution to the total market value is greater than one half. The octagon is centered within the first square, with each of its sides either parallel or canted at 45 degrees relative the sides of the first square. Illustrating application of this rule, Figure 20 shows center asset region 1550 as contributing 60% of the total market value, and asset regions 1510-1540 as each contributing 10% to the market value.
6. If the center asset region is rendered according to rule 5 then render the other four regions according to rules 4(a) and 4(b), with one or more of the regions possibly divided into two or more parts separated by one or more portions of the center asset

region. Figure 21 shows center asset region 1550 representing a contribution of 60%, regions 1520 and 1540 both representing 3% contributions, and regions 1510 and 1530 each representing 17% contributions. Regions 1510 and 1530 are each divided into two non-contiguous parts by respective portions of center regions 1550, in accord with this rule.

7. If one or more of the asset categories has a negative value or negative contribution to the market value, render the positive values or contributions of the other asset categories according to applicable ones of rules 2-6 and render each negative asset region as a square or rectangular (or other regular or irregular) inclusion or indentation in a contrasting or otherwise visible outline of the first square, with the inclusion or indentation originating from the associated icon (or point of origin) and defining an area actually or apparently proportional to the negative value or contribution of the asset region. The area enclosed by the black line represents the total value after allowing for negative items.

Figures 22 and 23 show aids which depict market values resulting from positive and negative asset contributions. Specifically, Figure 22 shows region 1510 representing a 30% contribution, regions 1520 and 1530 each representing a 30% contribution, region 1540 (shown as an indentation or cutout or notch in periphery 1502) representing a negative or minus 20% contribution, and region 1550 representing a 30% contribution. Icon 1542 as well as the position of the indentation in the lower left corner identify it as being associated with the financial asset category. Figure 23 shows a market value with regions 1510-1520 each representing 30% contributions and center region 1550 representing a negative 20% contribution. The negative 20% contribution is denoted with a distinctive outline of the center region and an omission of the interior filling.

Some embodiments represent a negative contribution as unfilled regions outlined or defined in one or more lines of the relevant color or other indicia associated with the asset category. In this case, the total area of the filled blocks represents the total market value including the (one or more) negative contributions. Additionally, two separate aids, one with positive contributions and the other with negative contributions, are presented side by side in some embodiments, with the negative, for example, being distinguished with appropriate labeling or with unfilled regions.

Other embodiments of the invention augment one or more of the exemplary graphic aids with a description of the economic events or aggregation of events associated or portrayed by the one or more graphic aids. Additionally, some embodiments include an area scale indicating the monetary amounts.

Figures 24 and 25 further illustrate the explanatory power of graphs made in accord with principles of the present invention. In particular, Figure 24 shows two displays 2410 and 2420. Display

2410 illustrates the conventional accounting practices of computing book value as the sum of physical and financial assets, ignoring any contribution from intangible assets. Display 2420 illustrates that actual market value is not only much greater than the book value of a business represented in display 2410, but also accounts for the contributions of previously unreported and unevaluated customer and employee assets. The inventors also view displays 2410 and 2410 has highlighting an economic shift from the industrial age to the so-called information age. Figure 25 shows a similar display 2500 which superimposes a conventional book value (consisting of physical and financial assets) on a market value. The space between the peripheries of the bookvalue and the market value indicate the difference between them.

Figure 26 shows four displays 2610, 2620, 2630, 2640 illustrating potentially characteristic roles of the five asset categories in contributing to the market value of business in particular business sectors. Display 2610 shows a market value decomposition for businesses in the service sector; display 2620 shows a market value decomposition for businesses in the financial services sector; display 2630 shows a market value decomposition for businesses in the information services sector; and display 2640 shows one for businesses in the manufacturing sector.

Value displays of the exemplary embodiment as well as those of other embodiments in accord with the invention have a wide number of uses. A first use is to record the following types of economic events either individually or in combination for any period: equity investment, asset investment, value creation, value reduction, value realization, other value exchanges, and value distribution. The exemplary embodiments assume that there are eight types of economic event which can affect an entity's economic position or market value: I. equity investment, II. asset investment, III. value creation, IV. value reduction, V. value realization, VI. value exchange, VII. value distribution, and VIII. equity exchange. The exemplary embodiment defines an equity investment as any exchange of an asset from any one of the asset categories in exchange for an equity interest in the entity receiving assets. An asset investment occurs when an entity make an investment by providing financial assets to others in exchange for the receipt of assets in any of the asset categories. Value creation for an entity occurs when the value of any asset category increases. Value reduction for an entity occurs when the value an asset in any category falls. Value realization for an entity occurs when an entity receives financial assets in exchange for any of its assets. Value exchanges other than asset investments and value realizations that involve no financial assets are defined as other value exchanges. Value distribution occurs when an entity distributes assets to others without directly receiving any assets in exchange. An equity exchange occurs when a holder of an equity interest in an entity exchange all or a portion of its equity interests for other assets held outside the entity.

A second use is to combine economic event types I to VII above for the entire history of an entity to give its economic position at any point in time and show a total entity value for comparison and reconciliation to the value evidenced by equity exchange transactions (economic event type VIII). A

related third use is to use these displays to report an entity's economic position and performance to both internal and external users.

A fourth use is to create displays that provide an alternative presentation of the information presented by entities in the balance sheets and income, cash flow and other statements required under generally accepted accounting principles. For example, one can use the representation principles to represent conventional book value.

A fifth use is to present the alternative business model designs (or combinations of assets) that are central to an entity's strategy using relative or absolute asset values.

A sixth use is to prepare hypothetical and prospective information for internal use by the management of an entity and for use by people external to the entity.

A seventh use is to support an entity's strategic decision-making and risk management by modeling the potential impact of events in the entity's economic environment and the entity's own asset management processes on the value of the entity.

An eighth use is to compare the economic position and performance of different entities or the same entity at different points in time and analyze the differences using value displays.

A ninth use is to highlight and analyze differences between the economic position and performance of an entity as evidenced by the entity's own reporting and by the values at which equity exchanges occur.

A tenth use is to illustrate generic differences between the business models (or combinations of assets) employed by entities in different industries and in different periods of economic history using relative or absolute asset values.

An eleventh use is to present hypotheses of the contributions made by different asset categories to the total value of an entity.

A twelfth use is to show the evolution of an entity by presenting a time series of value displays in real or accelerated time.

## Section 5 --- Glossary

The description includes many terms with meanings derived from their usage in the art and/or from their contextual usage within this description. However, as a further aid to understanding the invention, the following term definitions are presented.

**Business** refers broadly to any operating business such as any commercial, industrial, financial, or service activity in an economy. The term also refers to specific organizations, in the sense of a "business," operating as a "going concern" that manufactures or sells products or services to customers, and generates economic value by maximizing profits and shareholder wealth as opposed to conventional investment management or portfolio management. Equivalent terms used herein include firm and

company.

**Market Value** refers to the value of a publicly traded company based on its price per share multiplied by the total number of shares outstanding. For private companies and non-profit organizations, the term means a reasonable estimate of "implied market value." It also refers to other market-based parameters, such as price-to-earnings (P/E) ratio, total shareholder return (return per share times total number of shares) over a defined period, market-to-book (M/B) multiple, or any other indicator of economic value of a business or a component or division of a business.

**Business item** refers to any data or information that can be numerically represented and that can be shown to be statistically significant or otherwise relevant to the market value of a business. Business items can be assets, liabilities, or hybrid asset-liabilities which behave as assets under certain circumstances and as liabilities under others. Business items can be fixed or variable. For examples of actual or potential business items, see Appendix A.

**Tangible Business Item** refers to any data or information concerning financial capital and physical assets, such as inventory, property, plants, and equipment, which are conventionally listed or reported on a balance sheet pursuant to Generally Accepted Accounting Principles (GAAP). Tangible business items include both current and non-current physical and financial assets. Certain types of physical and financial assets, like inventories and accounts receivable, are defined as current because of the expectation that they will be converted to cash within a given operating year or operating period. Other tangible assets, like property, plant, and equipment that are used for longer periods of time, are generally defined as non-current.

**Intangible Business Item** refers to any business item that is not a tangible business item. Examples of intangible assets include customers, existing customer relationships, knowledge of customers, employees, existing employee relationships, knowledge of employees, organizational knowledge, ability to perform processes, brand or trademark strength, research and development. Moreover, the term intangible asset also generally encompasses business items which are not typically reported or quantified as assets on conventional balance sheets or which are considered as contributing to "goodwill." According to conventional accounting rules (GAAP), goodwill, generally recognized only at the time of a business acquisition, is the amount paid for a business in excess of the fair market value of its (tangible) assets, minus any liabilities assumed in the acquisition.

**Physical Assets** includes business items related to physical business resources. Examples include physical assets such as inventory, property, plant, and equipment. More generally, the physical assets category encompasses fixed assets Property, Plant and Equipment (PP&E) - which are depreciated using various depreciation methods and depreciation schedules, and short-term physical assets, or inventory. Overall, physical assets and their associated liabilities relate to an organization's infrastructure to acquire, manufacture, or distribute raw materials and finished products. Physical business items also characterize a company's ability to secure raw materials cost effectively, its production capacity, and its management



of finished goods and distribution.

**Financial Assets** includes business items related to assets and liabilities associated with financial position, such as accounts receivable, accounts payable, cash on hand, mortgages,. Specific examples of financial assets include a company's financial base (that is, the number of investors, their propensity to invest more in the business and the company's relationships and communications with them). It also includes cash and cash reserves, operating capital, marketable securities and other financial instruments. (Financial asset refers debt, equity, cash flow.)

**Employee (or Provider) Assets** comprises business items related to individuals and entities involved in producing and distributing the products or services of a business. The category thus includes not only the company's management team and employees, but also suppliers-alliance partners and their management and employees. This category also comprises brands created, and the intellectual capital and intellectual property supporting the processes of a business. The category also includes assets and associated liabilities in an in-bound supply chain for a business --- in other words, what is required to produce its products or services, as well as the offering itself. Information concerning labor costs and statistics is also included in this category.

**Customer Assets** includes business items related to individual and business buyers and channels of distribution, which include the various ways that companies deliver products and services to customers (for example, physical outlets or storefronts, telephone sales, direct mail, Internet sales, and so forth). Overall, the customer assets category contains assets and associated liabilities of the out-bound supply chain, including market share and sales and distribution partners. The asset category also captures factors related to the strength of a company's relationships with customers in terms of repurchase behavior. And it includes as an asset a company's ability to leverage its customers, to use information about customers to encourage more purchasing, and to improve or expand product and service lines to gain market share.

## Section 6 --- Appendices

Other embodiments and/or aspects of the invention are described or implied in one or more of the appendices of this application. The appendices are as follows:

- Appendix A: Exemplary Classification and Catalog of Business Data Items
- Appendix B: Exemplary Asset-weighting Questionnaire and Assessment Procedure
- Appendix C: Variable Definitions and Equations for Exemplary System Dynamics Model in Figures 6 and 7

## APPENDIX A

**Table Illustrating Exemplary Classification of Business Data  
and  
Exemplary Catalog of Business Data**

<b>FINANCIAL</b>	<b>PHYSICAL</b>	<b>EMPLOYEE</b>	<b>CUSTOMER</b>
ASSETS	CAPEXP	EMPLOYEE	BACKLOG
ASSETSC	DEPTCAP	PENEXP	ADVERT
CAPSURP	DEPRA	PRTMTBA	SALES
CASHST	EARN		SGAEXP
COGS	INV		
DEBTLT	INVOTH		
DEBTPRSTK	INVRAW		
DIVCOM	INVWIP		
DIVPR	PPBLDC		
DIVPRAR	PPCIPCST		
EPS	PPGROSS		
EPSD	PPLANDC		
EQUITY	PPLANT		
EXTRA	PPLEASC		
GOODWILL			
INTEXPLT			
LIABC			
NETINC			
NOPINC			
NOTESPAY			
OPINION			
PENOVPA			
PPMACHC			
PPMATC			
PRSTKCARV			
PRSTKCON			
RECVST			
RECVTRD			

RESEARCH			
SPCOM			
STKCOM			
TREAS			
WCAPBAL			

**Exemplary Catalogue of Business Data**

ADR	ADR Ratio
ACTCHG	Accounting Changes - Cumulative Effect MM\$
ACCPAY	Accounts Payable MM\$
ACCPAYAL	Accounts Payable and Accrued Liabilities - Increase (Decrease) MM\$
ACCRECV	Accounts Receivable - Decrease (Increase) MM\$
ACCREXP	Accrued Expenses MM\$
ACQUISIC	Acquisition-Income Contribution MM\$
ACQUISSC	Acquisition-Sales Contribution MM\$
ACQUIS	Acquisitions (Statement of Cash Flows) MM\$
ADJPAY	Adjustment Factor (Cumulative)- Payable Date Ratio
ADJ	Adjustment Factor (Cumulative)-Ex-Date Ratio
ADVERT	Advertising Expense MM\$
AMOINTG	Amortization of Intangibles MM\$
ASSETSNP	Assets - Nonperforming MM\$
ASSETSLO	Assets and Liabilities-Other (Net Change) (Statement of Cash Flows) MM\$
ASSETSO	Assets-Other MM\$
ASSETSOXD	Assets-Other-Excluding Deferred Charges MM\$
ASSETSR	Assets-Total (Restated) MM\$
ASSETS	Assets-Total/Liabilities and Stockholders' Equity-Total MM\$
OPINION	Auditor/Auditor's Opinion Code
CUSIP	CUSIP Number
CAPEXPR	Capital Expenditures (Restated) MM\$
CAPEXP	Capital Expenditures (Statement of Cash Flows) MM\$
CAPSURP	Capital Surplus MM\$
DIVCASH	Cash Dividends (Statement of Cash Flows) MM\$
CASH	Cash MM\$
CASHFF	Cash and Cash Equivalents-Increase (Decrease)(Flow of Funds Stmt.) MM\$
CASHST	Cash and Short-Term Investments MM\$
DEBTCHG	Changes in Current Debt (Statement of Cash Flows) MM\$
CHARGE	Charge-Offs (Net) MM\$
EQLIQV	Common Equity-Liquidation Value MM\$
EQCOM	Common Equity-Tangible MM\$
EQUITY	Common Equity-Total MM\$
HOLDERS	Common Shareholders M
SHARES	Common Shares Outstanding MM
SHSCONDEBT	Common Shares Reserved for Conversion- Convertible Stock MM
SHSCONOPT	Common Shares Reserved for Conversion- Stock Options MM
SHSCONOTH	Common Shares Reserved for Conversion- Warrants and Other MM
SHSCON	Common Shares Reserved for Conversion-Total MM
SHSTRD	Common Shares Traded MM
SHSEPSD	Common Shares Used to Calculate EPS (Fully Diluted) MM
SHSEPSR	Common Shares Used to Calculate EPS (Primary) (Restated) MM
SHSEPS	Common Shares Used to Calculate EPS (Primary) MM
STKCARV	Common Stock - Per Share Carrying Value \$
STKEQ	Common Stock Equivalents-Dollar Savings MM\$
STKCOM	Common Stock MM\$
SHSCONPRSTK	Common Shares Reserved for Conversion- Preferred Stock MM
NAME	Company Name
COMPBAL	Compensating Balance MM\$
LIABCGT	Contingent Liabilities-Guarantees MM\$
DEBTPRSTK	Convertible Debt and Preferred Stock MM\$
COGSR	Cost of Goods Sold (Restated) MM\$

COGS	Cost of Goods Sold MM\$
COUNTY	County Code of Primary Location
CURTRAN	Currency Translation Rate \$
ASSETSCO	Current Assets-Other MM\$
ASSETSCOX	Current Assets-Other-Excluding Prepaid Expenses MM\$
ASSETSC	Current Assets-Total MM\$
LIABCOTH	Current Liabilities-Other MM\$
LIABCOXA	Current Liabilities-Other-Excluding Accrued Expenses MM\$
LIABC	Current Liabilities-Total MM\$
DEBTSDC	Debt-Consolidated Subsidiary MM\$
DEBTSDF	Debt-Finance Subsidiary MM\$
DEBTCL	Debt in Current Liabilities MM\$
DEBTCAP	Debt-Capitalized Lease Obligations MM\$
DEBTCON	Debt-Convertible MM\$
DEBTDEB	Debt-Debentures MM\$
DEBT1	Debt-Due in One Year MM\$
DEBTM5	Debt-Maturing in Fifth Year MM\$
DEBTM4	Debt-Maturing in Fourth Year MM\$
DEBTM2	Debt-Maturing in Second Year MM\$
DEBTM3	Debt-Maturing in Third Year MM\$
DEBTMTG	Debt-Mortgages and Other Secured MM\$
DEBTNOTE	Debt-Notes MM\$
DEBTSCON	Debt-Senior Convertible MM\$
DEBTSUBCON	Debt-Subordinated Convertible MM\$
DEBTSUB	Debt-Subordinated MM\$
DEBTUA	Debt-Unamortized Debt Discount and Other MM\$
DEFCHRG	Deferred Charges MM\$
DEFTAXBAL	Deferred Taxes (Balance Sheet) MM\$
DEFTAXINC	Deferred Taxes (Income Account) MM\$
DEFTAXFF	Deferred Taxes (Statement of Cash Flows) MM\$
DEFTAXCR	Deferred Taxes and Investment Tax Credit (Balance Sheet) MM\$
DEFTAXFED	Deferred Taxes-Federal MM\$
DEFTAXFOR	Deferred Taxes-Foreign MM\$
DEFTAXST	Deferred Taxes-State MM\$
DEPLETE	Depletion Expense (Schedule VI) MM\$
DEPREXP	Depreciation Expense (Schedule VI) MM\$
DEPRACIP	Depreciation (Accumulated)- Construction in Progress MM\$
DEPRABEG	Depreciation (Accumulated)-Beginning Balance (Schedule VI) MM\$
DEPRABLD	Depreciation (Accumulated)-Buildings MM\$
DEPRAEND	Depreciation (Accumulated)-Ending Balance (Schedule VI) MM\$
DEPRALAND	Depreciation (Accumulated)-Land and Improvements MM\$
DEPRALEAS	Depreciation (Accumulated)-Leases MM\$
DEPRAMACH	Depreciation (Accumulated)-Machinery and Equipment MM\$
DEPRANR	Depreciation (Accumulated)-Natural Resources MM\$
DEPRACHG	Depreciation (Accumulated)-Other Changes (Schedule VI) MM\$
DEPRAOTH	Depreciation (Accumulated)-Other MM\$
DEPRARET	Depreciation (Accumulated)-Retirements (Schedule VI) MM\$
DEPRR	Depreciation and Amortization (Restated) MM\$
DEPRFF	Depreciation and Amortization (Statement of Cash Flows) MM\$
DEPR	Depreciation and Amortization MM\$
DEPRA	Depreciation, Depletion, and Amortization (Accumulated) MM\$
DISCOP	Discontinued Operations MM\$
DPS	Dividends Per Share-Ex-Date \$
DPSPAY	Dividends Per Share-Payable Date \$

DIVCOM	Dividends-Common MM\$
DIVPR	Dividends-Preferred MM\$
DIVPRARR	Dividends-Preferred-In Arrears MM\$
EPSOP	EPS from Operations
EPSDR	Earnings Per Share (Fully Diluted)- Excluding Extra. Items (Restated) \$
EPSD	Earnings Per Share (Fully Diluted)- Excluding Extra. Items \$
EPSDIE	Earnings Per Share (Fully Diluted)- Including Extra. Items \$
EPSDIER	Earnings Per Share (Fully Diluted)- Including Extra. Items (Restated) \$
EPSR	Earnings Per Share (Primary)- Excluding Extra. Items (Restated) \$
EPSIE	Earnings Per Share (Primary)- Including Extra. Items \$
EPS	Earnings Per Share (Primary)-Excluding Extra. Items \$
EPSIER	Earnings Per Share (Primary)-Including Extra. Items (Restated) \$
EMPLOYR	Employees (Restated) M
EMPLOYEE	Employees M
EIN	Employer Identification Number
EQEARN	Equity in Earnings MM\$
EQUITYFF	Equity in Net Loss (Earnings) (Flow of Funds Statement) MM\$
XLIST	Exchange Listing and S&P Index Codes
EFXRATE	Exchange Rate Effect (Statement of Cash Flows) MM\$
EXCISE	Excise Taxes MM\$
EXTRA	Extraordinary Items MM\$
EXTRADOR	Extraordinary Items and Discontinued Operations (Restated) MM\$
EXTRADO	Extraordinary Items and Discontinued Operations MM\$
EXTRADOFF	Extra. Items and Discounted Operations (Statement of Cash Flows) MM\$
FILECODE	File Code
FINAN	Financing Activities - Net Cash Flow (Statement of Cash Flows) MM\$
FINANO	Financing Activities - Other (Statement of Cash Flows) MM\$
FYEND	Fiscal Year End
CURADJ	Foreign Currency Adjustment (Income Account) MM\$
FCODE	Format Code (Flow of Funds Statement)
FORTUNEI	Fortune Industry Code
FORTUNER	Fortune Rank Code
FUNDISO	Funds From Operations-Other (Flow of Funds Statement) MM\$
FUNDS	Funds From Operations-Total (Statement of Changes) MM\$
GOODWILL	Goodwill MM\$
INCXE	Income Before Extraordinary Items MM\$
INCXER	Income Before Extraordinary Items (Restated) MM\$
INCXEFF	Income Before Extraordinary Items (Statement of Cash Flows) MM\$
INCXEADJ	Income Before Extraordinary Items- Adjusted for Stock Equivalents MM\$
INCXEAC	Income Before Extraordinary Items- Available for Common MM\$
TAXESRFD	Income Tax Refund MM\$
TAXESACCR	Income Taxes Accrued - Increase/Decrease (Statement of Cash Flows) MM\$
TAXESPD	Income Taxes Paid (Statement of Cash Flows) MM\$
TAXESPAY	Income Taxes Payable MM\$
TAXESFED	Income Taxes-Federal MM\$
TAXESFOR	Income Taxes-Foreign MM\$
TAXESOTH	Income Taxes-Other MM\$
TAXESST	Income Taxes-State MM\$
TAXESR	Income Taxes-Total (Restated) MM\$
TAXES	Income Taxes-Total MM\$
FINC	Incorporation Code - Foreign
INVMFF	Increase in Investments (Statement of Cash Flows) MM\$
INDNAME	Industry Name
INTANG	Intangibles MM\$

INTCAP	Interest Capitalized MMS
INTCAPN	Interest Capitalized-Net Income Effect MMS
INTEXPR	Interest Expense (Restated) MMS
INTEREST	Interest Expense MMS
INTEXPLT	Interest Expense on Long-Term Debt MMS
INTEXP	Interest Expense-Total (Financial Services) MMS
INTINCNET	Interest Income (Net) (Tax Equivalent) MMS
INTINC	Interest Income MMS
INTINCTOT	Interest Income-Total (Finance Services)MMS
INTMAR	Interest Margin (Net) (Spread)
INTPD	Interest Paid - Net (Statement of Cash Flows) MMS
INVFIN	Inventories-Finished Goods MMS
INVLIFO	Inventories-LIFO Reserve MMS
INVOTH	Inventories-Other MMS
INVRW	Inventories-Raw Materials MMS
INV	Inventories-Total MMS
INWIP	Inventories-Work in Process MMS
INVC	Inventory - Decrease (Increase) (Statement of Cash Flows) MMS
INVAL	Inventory Valuation Method Code
INVMCAP	Invested Capital-Total MMS
INVMACTV	Investing Activities - Net Cash Flow (Flow of Funds Statement) MMS
INVMACTVO	Investing Activities - Other (Statement of Cash Flows) MMS
INVMCRBAL	Investment Tax Credit (Balance Sheet) MMS
INVMCRINC	Investment Tax Credit (Income Account) MMS
INVMEQ	Investments and Advances-Equity Method MMS
INVMADVO	Investments and Advances-Other MMS
LABOR	Labor and Related Expenses MMS
LIABOTH	Liabilities-Other MMS
LIAB	Liabilities-Total MMS
ASSETSLLP	Loan/Assets Losses - Provision For MMS
ASSETSLLR	Loan/Assets Losses - Reserved For MMS
DEBTLTSS	Long-Term Debt-Insurance (Statement of Cash Flows) MMS
DEBTLTO	Long-Term Debt-Other MMS
DEBTLTP	Long-Term Debt-Tied To Prime MMS
DEBTLTR	Long-Term Debt-Total (Restated) MMS
DEBTLT	Long-Term Debt-Total MMS
MARKSEC	Marketable Securities Adjustment (Balance Sheet) MMS
MINORBAL	Minority Interest (Balance Sheet) MMS
MINORINC	Minority Interest (Income Account) MMS
MINORR	Minority Interest (Restated) MMS
NETINCR	Net Income (Loss) (Restated) MMS
NETINC	Net Income (Loss) MMS
NETINCADJ	Net Income Adjusted for Common Stock Equivalents MMS
OPLOSS	Net Operating Loss Carry Forward- Unused Portion MMS
NOPINCR	Nonoperating Income (Expense) (Restated) MMS
NOPINCXI	Nonoperating Income (Expense) Excluding Interest Income MMS
NOPINC	Nonoperating Income (Expense) MMS
NOTESPAY	Notes Payable MMS
OPCF	Operating Activities - Net Cash Flow (Statement of Cash Flows) MMS
OPINCAD	Operating Income After Depreciation MMS
OPINCB	Operating Income Before Depreciation MMS
BACKLOG	Order Backlog MMS
PENOVABO	Pension - Accumulated Benefit Obligation (Overfunded) MMS
PENUNABO	Pension - Accumulated Benefit Obligation (Underfunded) MMS

PENAML	Pension - Additional Minimum Liability (Underfunded) MMS
PENOVOA	Pension - Other Adjustments (Overfunded) MMS
PENUNOA	Pension - Other Adjustments (Underfunded) MMS
PENOVPA	Pension - Prepaid/Accrued Cost (Overfunded) MMS
PENUNPA	Pension - Prepaid/Accrued Cost (Underfunded) MMS
PENOVPO	Pension - Projected Benefit Obligation (Overfunded) MMS
PENUNPO	Pension - Projected Benefit Obligation (Underfunded) MMS
PENOVUPSC	Pension - Unrecognized Prior Service Cost (Overfunded) MMS
PENUNUPSC	Pension - Unrecognized Prior Service Cost (Underfunded) MMS
PENOVVBO	Pension - Vested Benefit Obligation (Overfunded) MMS
PENUNVBO	Pension - Vested Benefit Obligation (Underfunded) MMS
PENROR	Pension Benefits-Assumed Rate of Return %
PENINFO	Pension Benefits-Information Date MMDDYY
PENBEN	Pension Benefits-Net Assets MMS
PENPVN	Pension Benefits-Present Value of Nonvested MMS
PENPVV	Pension Benefits-Present Value of Vested MMS
PENCUPPS	Pension Costs-Unfunded Past or Prior Service MMS
PENCUVB	Pension Costs-Unfunded Vested Benefits MMS
PENPLOVA	Pension Plan Assets (Overfunded) MMS
PENPLUNA	Pension Plan Assets (Underfunded) MMS
PENPLRRA	Pension Plan-Anticipated Long-Term Rate of Return on Plan Assets %
PENPLIC	Pension Plans-Interest Cost MMS
PENPLOPC	Pension Plans-Other Periodic Cost Components (Net) MMS
PENPLROC	Pension Plans-Rate of Compensation Increase %
PENPLRA	Pension Plans-Return on Plan Assets (Actual) MMS
PENPLSC	Pension Plans-Service Cost MMS
PENEXP	Pension and Retirement Expenses MMS
PENPC	Periodic Pension Cost (Net) MMS
PRTMTBC	Periodic Postretirement Benefit Cost (Net) MMS
PRTMTBA	Postretirement Benefit Asset (Liability) (Net) MMS
PRSTKCARV	Preferred Stock-Carrying Value MMS
PRSTKCON	Preferred Stock-Convertible MMS
PRSTKLIQV	Preferred Stock-Liquidating Value MMS
PRSTKNON	Preferred Stock-Nonredeemable MMS
PRSTKRED	Preferred Stock-Redeemable MMS
PRSTKREDV	Preferred Stock-Redemption Value MMS
PREEXP	Prepaid Expenses MMS
PREINCR	Pretax Income (Restated) MMS
PREINC	Pretax Income MMS
PREINCD	Pretax Income-Domestic MMS
PREINCF	Pretax Income-Foreign MMS
CLOSE	Price-Close \$
CLOSEFY	Price-Close-Fiscal Year-end \$
HIGH	Price-High \$
HIGHFY	Price-High-Fiscal Year-end \$
LOW	Price-Low \$
LOWFY	Price-Low-Fiscal Year-end \$
SPPIN	Primary S&P Index Marker
PPGROSS	Property, Plant and Equipment- Total (Gross) MMS
PPLANT	Property, Plant and Equipment- Total (Net) MMS
PPBEG	Property, Plant, and Equipment- Beginning Balance (Schedule V) MMS
PPBLD	Property, Plant, and Equipment- Buildings (Net) MMS
PPBLDC	Property, Plant, and Equipment- Buildings at Cost MMS
PPCAPEXP	Property, Plant, and Equipment- Capital Expenditures (Schedule V) MMS



PPCIP	Property, Plant, and Equipment- Construction in Progress (Net) MMS
PPCIPCST	Property, Plant, and Equipment- Construction in Progress at Cost MMS
PPLAND	Property, Plant, and Equipment- Land and Improvements (Net) MMS
PPLEAS	Property, Plant, and Equipment- Leases (Net) MMS
PPLEASC	Property, Plant, and Equipment- Leases at Cost MMS
PPMACH	Property, Plant, and Equipment- Machinery and Equipment (Net) MMS
PPON	Property, Plant, and Equipment- Other (Net) MMS
PPOC	Property, Plant, and Equipment- Other at Cost MMS
PPRET	Property, Plant, and Equipment- Retirements (Schedule V) MMS
PPLANTR	Property, Plant, and Equipment- Total (Net) (Restated) MMS
PPEND	Property, Plant, and Equipment-Ending Balance (Schedule V) MMS
PPLANDC	Property, Plant, and Equipment-Land and Improvement at Cost MMS
PPMACHC	Property, Plant, and Equipment-Machinery and Equipment at Cost MMS
PPNAT	Property, Plant, and Equipment-Natural Resources (Net) MMS
PPNATC	Property, Plant, and Equipment-Natural Resources at Cost MMS
PPOTH	Property, Plant, and Equipment-Other Changes (Schedule V) MMS
PURSTK	Purchase of Common and Preferred Stock (Statement of Cash Flows) MMS
RECVCO	Receivables-Current-Other MMS
RECVEST	Receivables-Estimated Doubtful MMS
RECV	Receivables-Total MMS
RECVTRD	Receivables-Trade MMS
DEBTLTRDC	Reduction of Long-Term Debt (Statement of Cash Flows) MMS
RISKT1	Regulatory Risk-Based Capital Ratio-Tier1
RISK	Regulatory Risk-Based Capital Ratio-Total
RENTM1	Rental Commitments-Minimum- First Year MMS
RENTMINS	Rental Commitments-Minimum- Five Years Total MMS
RENTM5	Rental Commitments-Minimum-Fifth Year MMS
RENTM4	Rental Commitments-Minimum-Fourth Year MMS
RENTM2	Rental Commitments-Minimum-Second Year MMS
RENTM3	Rental Commitments-Minimum-Third Year MMS
RENTEXP	Rental Expense MMS
RENTINC	Rental Income MMS
RESEARCH	Research and Development Expense MMS
EARN	Retained Earnings (Class A Common Outstanding on Can. File) MMS
EARNR	Retained Earnings (Restated) MMS
EARNADJ	Retained Earnings - Cumulative Translation Adjustment MMS
EARNOTH	Retained Earnings - Other Adjustments MMS
EARNRSTM	Retained Earnings Restatement MMS
EARNUADJ	Retained Earnings-Unadjusted MMS
EARNUR	Retained Earnings-Unrestricted MMS
SPPAPER	S&P Commercial Paper Rating Code
SPCOM	S&P Common Stock Rating Code
SPIND	S&P Industry Index Code
SPREL	S&P Industry Index Relative Code
SPMAJI	S&P Major Index Code
SPDEBTSR	S&P Senior Debt Rating
SPDEBTSUB	S&P Subordinated Debt Rating
SIC	SIC Number
SALESTK	Sale of Common and Preferred Stock (Flow of Funds Statement) MMS
SALEINVM	Sale of Investments (Flow of Funds Statement) MMS
SALEPP	Sale of PP & E (Flow of Funds Statement) MMS
SALEPPI	Sale of PP & E and Sale of Investments (Statement of Cash Flows)
MM\$SALES	Sales (Net) MMS
SALESR	Sales (Restated) MMS

SPSIN	Secondary S&P Index Identifier
SGAEXP	Selling, General, Administrative Expenses MM\$
SGAEXPR	Selling, General, and Administrative Expenses (Restated) MM\$
DEBTSTAIR	Short-Term Borrowings-Average Interest Rate %DEBTSTAVG Short-Term Borrowings-Average MM\$
INVMSTCF	Short-Term Investments - Change (Statement of Cash Flows) MM\$
INVMST	Short-Term Investments MM\$
SOURCE	Source Document Code
SOURCEFO	Sources of Funds-Other (Statement of Changes) MM\$
SOURCEFT	Sources of Funds-Total (Statement of Changes) MM\$
SPECIAL	Special Items MM\$
STATE	State Code of Primary Location
STKOWN	Stock Ownership Code
EQSTKR	Stockholders' Equity (Restated) MM\$
EQSTK	Stockholders' Equity-Total MM\$
SPSII	Subset S&P Index Identifier
TICKER	Ticker Symbol
TREASCOM	Treasury Stock (Dollar Amount) - Common MM\$
TREASPRF	Treasury Stock (Dollar Amount) - Preferred MM\$
TREASMEMO	Treasury Stock (Memo Entry) MM\$
TREASSHS	Treasury Stock-No. of Common Shares
MMTREAS	Treasury Stock-Total Dollar Amount MM\$
UPCODE	Update Code
USEFO	Uses of Funds-Other (Statement of Changes) MM\$
USEF	Uses of Funds-Total (Statement of Changes) MM\$
WCAPBAL	Working Capital (Balance Sheet) MM\$
WCAPR	Working Capital (Restated) MM\$
WCAPCHG	Working Capital Change-Total (Statement of Changes) MM\$
WCAPCHGO	Working Capital Changes-Other- ( + / - ) (Statement of Changes) MM\$

## APPENDIX B

### Exemplary Asset Waiting Questionnaire and Analysis Procedures

The following method can be carried out in paper form, and can also be incorporated into a computer system program and run on the system of Figure 1 for which further detail of the components involved in such programs is shown in Figure 5. The following questions and tables for tabulating results are simply one embodiment of the invention. Each of the value factors are scored on a scale of "0" to "10." Here are some rules of thumb in scoring.

Consider measures of effectiveness. Scoring reflects a measure of "goodness" or "effectiveness" in each of these categories on the scale of "0" to "10." Assessing the number of investors, for example, does not involve an actual count of investors. Rather, it compares the effectiveness or "goodness" of the investor base of both companies in terms of size.

Calculate your score against the market high and low. You can do quick calculations to score yourself and the benchmark based on the high and low in the marketplace. Consider this example of number of customers. Let's say that you have determined that the market leader (or "10" on the scale) has 27,000 customers. The market low (or "0" on the scale) has just 3,000 and the midpoint (or "5" on the scale) is therefore 15,000. If I have 10,000 customers, I am just below the "3" on the scale. If my benchmark competitor has 17,000, that company is above the average, scoring just below the "6" on the scale. Grade your company and the competitor against the market high and low. Then grade your competitor against the market high and low as a second, independent exercise.

More is not always better. In scoring, you also need to remember that "more" is not always better. Consider productive capacity. Effectiveness in this category relates to a company's ability to produce enough, but not too much. Excess capacity can be as costly as under-capacity. It is the same in terms of inventory. Companies need to efficiently produce and distribute finished goods. Too much inventory is costly as it uses up finite resources without returning value, but too little means lost opportunities as the company fails to meet market demand.

#### Scoring an Asset Map

An Asset Map is scored for a target business entity and optionally a benchmark company across 20 questions. The following summary includes: 1) the data field/row or area of investigation; 2) the question to ask of yourself and the benchmark; 3) common measures that provide performance information on this element of value; and 4) a short description of issues related to it.

#### Section B1 --- Financial Assets

**Data Field:** Number of active investors

**Question:** How many active investors do you have?

**Measures:** Number of entities and individuals that bought shares in last 12 months.

In the case of a public company, assess your total shareholder base . In the case of a private company, look to your collective sources of capital, including lending institutions, limited partners and other types of equity partners.

**Data Field:** Propensity to invest in the company

**Question:** Do the company's existing investors make additional investments?

**Measure:** % of established shareholders investing more in the last 12 months. Ease of gaining private financing/refinancing.

Score the company on the willingness or interest of investors to reinvest in the company. Companies with higher scores inspire confidence in their ability to produce future cash flows and investment returns. They will have greater ease in raising debt or equity.

**Data Field:** Investor Communications

**Question:** How effective are the company's investor communications?

**Measures:** Frequency of communication. Per capita annual expenditures on investor relations. % of investment, or divestiture, decisions that are based on incorrect perception about the company.

Score this question based on how effectively a company communicates value to investors. Score it also on its effectiveness in creating more value due to investor communication. Companies effective in this area take responsibility for "damage control" when needed due to market events. They guard against investor surprises that can lead to sharp fluctuations in share prices following quarterly earnings reports. Qualitative assessments of communications/content and how companies reach out to investors and use investor feedback are additional measures.

**Data Field:** Economic performance of financial products

**Question:** What is the company's rate of return to investors?

**Measures:** two-year investor ROI.

Assess the track record in terms of stock prices, dividends, track record of repaying debt, or other measures revealing "return on investments" in various forms.

## Section B2 --- Physical Assets

**Data Field:** Security of supply of raw materials

**Question:** Do you have good control of the supply of raw materials?

**Measures:** \$ of customer orders lost due to materials shortages. # of supply sources/key raw materials. Location in relation to raw material supplies.

Assess the business control over the supply of raw materials. For example, a company will be more vulnerable if dependent on a single source of important raw materials, or the resources are of high

cost and dwindling supply. Location is also a key attribute. Closer proximity may mean more secure, efficient or lower cost availability. Also consider the company's historic rate of turnover of key suppliers.

**Data Field:** Productive capacity of resources (owned and unowned)

**Question:** Do you and your suppliers have appropriate levels of productive capacity? Or, in the service industry, do you and your suppliers have appropriate staff and customer facilities

**Measures:** % of customer orders lost due to production capability or facilities.

Assess the productive capacity of the company (using both its own resources and those it does not own). This involves three factors – cost, volume and timeliness. Producing 300,000 cell phones for \$1,200 each might reveal strong production capabilities in terms of numbers, but the cost would prevent market success. Slow or efficient processes that delay time-to-market vis a vis the competition also would result in a low score.

**Data Field:** Finished goods management and distribution

**Question:** Do you effectively manage and distribute your finished goods?

**Measures:** Inventory turns, cost of delivery, returned materials cost

Assess the company's ability to optimize inventory. The asset or liability characteristics of inventory management involve both inventory size and change. The key issue for a company is its ability to optimize inventory, relating production/distribution capacity to market demand. Location issues also come into play since they may generate complex distribution processes, depending on the geographic relationship of production and markets.

### Section B3 --- Provider or Employee Assets

**Data Field:** Management expertise

**Question:** Does management generate effective processes and culture?

**Measures:** Strategies and operational changes that increases business

Assess a company's management expertise. The element of "expertise" means more than simply the strength of the senior management team. It also reflects management's ability to create value due to factors such as leadership style, industry understanding, a vision of the future, etc. This is reflected in stock markets as prices rise and fall sharply if a key leader is gained or lost. If you are the CEO scoring this test, ask yourself how your investors or customers might rank you.

**Data Field:** Workforce effectiveness

**Question:** Does the company's staff effectively apply the right know-how?

**Measures:** Years of experience and education. Changes in employee performance grading. Staff and

supplier turnover.

Score the company based on the effectiveness of the workforce as a factor of knowledge, skills and competencies to meet corporate objectives.

**Data Field:** Appropriate size of workforce

**Question:** Does the company have an appropriate size of workforce (direct and indirect)?

**Measures:** # of employees. Ratio employees/customers. Ratio employees/revenue. % employees working overtime. Frequency of layoffs.

A company requires a workforce that is appropriate in size – not too large or small. Appropriateness of size, for example, requires a balance between “lean” and sufficient elasticity to respond to change.

**Data Field:** Product offering

**Question:** Are products clearly effective for their purposes?

**Measures:** Product ratings and awards. Frequency of customer complaints/litigation. Level of customer satisfaction. Repeat sales/customer.

The product and service offerings become an asset or liability depending on such factors as suitability, pricing to market, appropriateness for task (e.g., fit for purpose), and customer/market perceptions of all of these factors. Score this category according to the collective strength or weakness of these factors.

**Data Field:** Customer Service

**Question:** Does your customer service encourage more business?

**Measures:** % of customers satisfied on first call. Level of customer satisfaction. Customer service costs/customer. Employee and customer satisfaction with service processes.

Customer service includes the company’s culture of service, training, information systems used to support it and the effectiveness of using information to improve customer service processes. The breadth and depth of customer service processes and the information system are important factors in effectiveness.

**Data Field:** Effectiveness of compensation

**Question:** Are your staff effectively motivated by their compensation structure?

**Measures:** Average years with company. Annual percentage turnover.. Satisfied employee/provider indices.

Assess the degree to which compensation structures are an asset or liability for a company. Consider not just compensation levels, but the structure itself. Compensation effectiveness relates to a

combination of factors, including salary, bonuses, equity and other forms of gain-sharing that motivate performance and align the goals of individuals and the company. Effectiveness of compensation is reflected in employee loyalty and turnover rates, as well as recruiting and retraining costs. Productivity levels by individual/teams may be a useful, indirect measure.

**Data Field:** Propensity to leverage in-bound partners

**Question:** Do you make effective use of in-bound partners?

**Measures:** Proportion of employees to labor force (suppliers, sub-contractors and outsourcing)

Assess the company's ability to use its partners to create and add value in producing a product or service. In-bound partners include all those companies and individuals who support the production of products or services. In-bound partners, for example, would include a company's major suppliers. They also include services, like an accounting firm or management consulting advising on internal processes. Ask to what degree and depth a company makes use of these relationships. In the case of an accountant, for example, ask if that person is simply used for routine bookkeeping or tax work? Or does the company leverage that person's knowledge in more depth to support value creation?

#### Section B4 --- Customer Assets

**Data Field:** Number of customers

**Question:** How many active customers do you have?

**Measures:** # of customers purchasing in the last year.

Assess the size of the customer base. Measurements include numbers of customers and proportion of vital few customers to total customer base.

**Data Field:** Propensity to purchase from the company

**Question:** How loyal are your existing customers?

**Measures:** % probability customer will repurchase. Customer retention rates.

Assess the readiness of customers to purchase and repurchase products or services. This is a factor relating to customer loyalty and repeat purchase behavior.

**Data Field:** Market share

**Question:** What is the company's market share?

**Measures:** % market share. Company sales to total sales.

Assess the degree of market share dominance of your company and the benchmark company.

**Data Field:** Propensity to leverage out-bound partners.

**Question:** Do you make effective use of out-bound partners?

**Measures:** Channel value added less channel discount

Assess the effectiveness of a company in leveraging out-bound partner relationships to produce higher sales revenue and improved customer relationships. Out-bound partners are all those companies and individuals who support the marketing and sales process in delivering products/services to market. They include the channels of distribution, field sales forces of partners or intermediaries, wholesalers, marketing consultants, franchisers, and advertising, public relations and marketing firms. Effectiveness of cross-selling strategies to amplify the impact of sales forces is one example of strength in this area. Strategic marketing of products/services of two companies to increase value with more comprehensive offerings to customers is another. Developing formal "feedback" processes to capture knowledge of wholesalers and other intermediaries about the marketplace also reflects a company's propensity to leverage out-bound partners.

**Data Field:** Propensity of company to leverage knowledge of customers

**Question:** Do you make use of your knowledge about customers?

**Measures:** Effectiveness of direct marketing. Number of customer contacts annually. Frequency/extent of market research.

Assess effectiveness of a company to secure greater value by knowing more about their customers. Companies scoring high on this attribute understand how to create longer-lived customer relationships by better understanding their wants/needs. A company's ability to apply customer knowledge in product/service design is one indicator of strength in this area. Companies leveraging knowledge of customers effectively also may build information systems with customer profiles, data mine for information to support product design and marketing strategies, and develop capabilities for mass customization.

**Data Field:** Brand

**Question:** How effective is brand in creating value for the company?

**Measures:** Level of brand recognition. The impact of brand on product price.

Assess the effectiveness of brand in value terms. To what extent does it support the value proposition of the business?

Advanced use of the Scoring system

Additional insight can be gained from advanced use of this tool to more closely inspect changes in the value of assets and to compare with different benchmarks.

Direction and rate of change. Consider the trend in the increase or decrease of the assets, and the rate of that change. Now, adjust the asset scores to reflect the direction of that trend and the rate of that



change. Add one point for trends that increase in value and subtract one point for trends that decrease in value. Add another point for a significant rate of increase in value and subtract another point for a significant decrease in value.

**Weighted Averages.** An additional exercise involves a self-weighting of assets on their relative important to the total value of each category. For example, some assets overlap in value with others, or are of less significance to the total. To weight scores, assign weighting of 100 to the most important asset in each of the four categories. Then assign appropriate weightings to the remaining items to represent their significance relative to the top item. You can then calculate a “weighted average” by multiplying the scores by their weighting, then dividing by the number of assets to obtain the average for each of the four categories – Financial, Physical, Provider and Customer.

**Calibration.** An additional exercise involves a self-calibration of assets on their relative important to your company or market space. For example, some companies require large numbers of customers to sell volume to. The number of customers is thus more important than to another company that focuses on a vital few. To calibrate scores, assign calibration of 100 to the most important asset in each of the four categories. Then assign appropriate calibrations to the remaining items to represent their significance relative to the top item. You can then calculate a “calibrated weighted average” by multiplying the scores by their weighting and by their calibration, then dividing by the square of the number of assets to obtain the calibrated average for each of the four categories – Financial, Physical, Provider and Customer.

***What-if analysis.*** Imagine the change that you would like to make in your company and re-work the exercise using that imaginary company as ‘My Company.’

***Moving targets.*** Re-work the exercise using one-year-old data and note how your assets, the benchmark’s assets and the market boundaries are moving. Now, apply these changes as simple trends to project the relationship one year from now.

## Asset Effectiveness Form

## Section A - Asset Elements

Category / Element	My Company	The Benchmark Company
<b>Financial Assets</b>		
Number of active investors	0 1 2 3 4 5 6 7 8 9 10	0 1 2 3 4 5 6 7 8 9 10
Propensity to invest in the company	0 1 2 3 4 5 6 7 8 9 10	0 1 2 3 4 5 6 7 8 9 10
Investor communications	0 1 2 3 4 5 6 7 8 9 10	0 1 2 3 4 5 6 7 8 9 10
Economic performance of financial products	0 1 2 3 4 5 6 7 8 9 10	0 1 2 3 4 5 6 7 8 9 10
<b>Physical Assets</b>		
Location	0 1 2 3 4 5 6 7 8 9 10	0 1 2 3 4 5 6 7 8 9 10
Security of supply of raw materials	0 1 2 3 4 5 6 7 8 9 10	0 1 2 3 4 5 6 7 8 9 10
Productive capacity of resources	0 1 2 3 4 5 6 7 8 9 10	0 1 2 3 4 5 6 7 8 9 10
Finished goods management and distribution	0 1 2 3 4 5 6 7 8 9 10	0 1 2 3 4 5 6 7 8 9 10
<b>Provider Assets</b>		
Management expertise	0 1 2 3 4 5 6 7 8 9 10	0 1 2 3 4 5 6 7 8 9 10
Workforce effectiveness	0 1 2 3 4 5 6 7 8 9 10	0 1 2 3 4 5 6 7 8 9 10
Appropriate size of workforce	0 1 2 3 4 5 6 7 8 9 10	0 1 2 3 4 5 6 7 8 9 10
Effectiveness of compensation	0 1 2 3 4 5 6 7 8 9 10	0 1 2 3 4 5 6 7 8 9 10
Product offering	0 1 2 3 4 5 6 7 8 9 10	0 1 2 3 4 5 6 7 8 9 10
Customer service	0 1 2 3 4 5 6 7 8 9 10	0 1 2 3 4 5 6 7 8 9 10
Propensity to leverage in-bound partners	0 1 2 3 4 5 6 7 8 9 10	0 1 2 3 4 5 6 7 8 9 10
<b>Customer Assets</b>		
Number of active customers	0 1 2 3 4 5 6 7 8 9 10	0 1 2 3 4 5 6 7 8 9 10
Propensity to purchase from the company	0 1 2 3 4 5 6 7 8 9 10	0 1 2 3 4 5 6 7 8 9 10
Market share	0 1 2 3 4 5 6 7 8 9 10	0 1 2 3 4 5 6 7 8 9 10
Propensity to leverage out-bound partners	0 1 2 3 4 5 6 7 8 9 10	0 1 2 3 4 5 6 7 8 9 10
Propensity to leverage knowledge of customers	0 1 2 3 4 5 6 7 8 9 10	0 1 2 3 4 5 6 7 8 9 10
1. Brand strength	0 1 2 3 4 5 6 7 8 9 10	0 1 2 3 4 5 6 7 8 9 10

## Section B - Asset Category Averages

Category / Element	My Company	The Benchmark Company
Financial Assets	_____	_____
Physical Assets	_____	_____
Provider Assets	_____	_____
Customer Assets	_____	_____

## APPENDIX C

**Variable Definitions and Equation Notes  
for Exemplary Systems Dynamics Simulation in Figures 7 and 8**

**Key for Exemplary Data Sources**

- ND** Needs Defining (requires conceptual clarification before seeking data)  
**NP** Needs Proxy (abstract variable that needs real-world equivalent)  
**CR** Company Records (company-specific data, but should be available)  
**PR** Public Records (includes industry averages)  
**BE** Best Estimate (variable that is not captured and/or measurable; proxy unlikely; correlation analysis may be useful)  
**X** Not applicable to this embodiment or involves direct user input

Variable Name	Description	Data Source
<b>STOCKS</b>		
Alliance_Partners	The number of Alliance Partners the firm has.	ND
Initial value	The initial value of this stock.	
Avg_Deliveries	The average rate of delivery of goods by the firm and its Supplier Network.	CR
Initial value	The initial value of this stock.	
Backlog	The number of units that have been ordered but not yet delivered.	CR
Initial value	The initial value of this stock.	
Brand	This is the amount of Brand recognition of the product.	ND, NP
Initial value	The initial value of this stock.	
Customers	The number of Customers who purchase from the firm.	CR
Initial value	The initial value of this stock.	
Customer_Support_Technology	The quality of the firm's Customer Support Technology.	ND
Initial value	The initial value of this stock.	
Debt	The amount of Debt currently held by the firm.	CR
Initial value	The initial value of this stock.	
Employees	The number of Employees in the firm.	CR
Initial value	The initial value of this stock.	
Fin_Asset_\$_Val	The financial assets of the firm, measured in dollars.	CR
Initial value	The initial value of this stock.	
Fixed_Assets	The amount of Fixed Assets owned by the firm.	ND, CR
Initial value	The initial value of this stock.	

Knowledge_of_Cust omers	The level of knowledge the firm has about its customers wants, needs, and desires.	ND, NP
Initial value	The initial value of this stock.	
Natural_Resources_ Available	The amount of natural resources available.	ND, PR
Initial value	The initial value of this stock.	
Supplier_Network	The number of Suppliers to which the firm can outsource to supply its product.	CR, BE
Initial value	The initial value of this stock.	
Working_Public	The number of potential Employees who are not currently employed by the firm.	ND, PR
Initial value	The initial value of this stock.	
<b>USER INPUTS</b>		
Brand_spending	The rate of spending on building Brand recognition.	ND
CST_spending	The rate of spending on Customer Support Technology.	ND, CR
Outsource_to_Suppli er_Network	This element of the model is used to toggle Outsourcing to Supplier Network on and off.	X
sell_KoC_switch	This factor equals '1' when the firm sells its accumulated Knowledge of Customers, '0' otherwise.	X
Traditional_Firm	This element equals '1' if the firm does not engage in outsourcing activities, '0' otherwise.	X
<b>OTHER VARIABLES</b>		
Ability_to_Attract_& Retain	The ability of the firm to attract and retain Employees.	ND, NP
acquiring\paying_do wn_capital	The rate, in dollars per year, at which capital is acquired or paid down.	CR
acquiring_debt	This is the rate of acquiring Debt.	CR
adding_Fixed_Assets	The rate at which the firm acquires Fixed Assets.	CR
APs_added_per_Su pplier_or_Employee_ per_time	The number of new Alliance Partners each current Employee 'recruits' per unit of time.	BE
attracting_Employees	The rate at which the firm gains Employees	CR

base_KoC_per_transaction	This is the base amount of Knowledge of Customers gained per transaction. The quality of the firm's Customer Support Technology modifies this factor to determine the actual amount of knowledge gained per transaction.	BE
base_PE_mult	The base price to earning ratio of the firm.	CR
base_wom	The base word of mouth' multiplier (i.e., number of new Customers each current Customer 'recruits' per unit of time). This number is modified by several other factors to determine the actual 'wom mult'.	BE
book_value	The equity of the firm, in millions of dollars.	CR
Brand_building_from_brand_spending	The rate at which Brand recognition is built as a result of spending on Brand-building.	X
Brand_building_from_sales	This is the rate at which Brand recognition is built as a result of selling the product.	ND
Brand_built_per_\$	The non-linear degree to which the rate of Brand-building per \$k spent depends on Knowledge of Customers. Firm's with a low Knowledge of their Customers will gain less brand recognition per \$k spent than firm's with a high Knowledge of their Customers.	ND, BE
Brand_decaying	Brand recognition fades with time. This is the rate of losing Brand recognition.	ND, BE
building_KoC	The rate at which the firm builds Knowledge of its Customers.	ND
building_supplier_network	The rate at which new suppliers are added to the firm's supplier network.	ND, CR
buying_back\selling_equity	The rate, measured in dollars per year, at which equity is bought or sold.	CR
cap_adjust	When 'Traditional Firm' equals '1', this element equals the Fixed Asset shortfall.	X
cap_util	The degree of utilization of the firm's production capacity.	CR
capital_investment	The rate of spending on adding Fixed Assets.	ND, CR
change_in_AP	The rate at which Alliance Partners are added (when positive) or lost (when negative).	CR

Chg_avg	The rate of change in the average rate of delivery by the firm and its Supplier Network.	BE
CST_obsolescing	The rate at which Customer Support Technology obsolesces or otherwise loses its functional value.	ND, BE
cust_loss_frac	The fraction of current Customers lost per unit of time. This fraction decreases non-linearly as the firm's Knowledge of its Customers increases.	CR, BE
debt_service	The amount of interest accumulated by the current Debt per unit of time.	CR
delivering_by_internal	The rate at which the firm delivers units.	CR, BE
delivering_by_network	The rate at which the supplier network delivers units.	CR, BE
earnings_from_sales_of_KoC	The revenues from selling Knowledge of Customers per unit of time.	CR, BE
Equity	The combined value of the firm's physical and financial assets minus the amount of Debt held by the firm.	CR
Fixed_Asset_shortfall	The shortfall in amount of Fixed Assets necessary to eliminate the sales backlog.	CR
fixed_costs	The cost of maintaining the current base of Fixed Assets.	CR
gaining_Customers	The rate at which the firm gains new customers.	CR
gross_earnings	The gross earnings of the firm, measured in dollars per year.	CR
impact_of_Brand_on_wom	The impact of Brand recognition on the 'wom mult.'	BE
impact_of_CST_on_KoC_per_transaction	The impact of the firm's Customer Support Technology on the Knowledge of Customers gained per transaction.	BE
impact_of_cust_relations	The non-linear impact of the firm's Knowledge of Customers on the number of units demanded per customer per time.	BE
impact_of_KoC_on_wom	This determines the impact that the firm's Knowledge of Customers has on the 'wom mult.'	BE
impact_of_lead_time_on_sales	The non-linear impact that lead time has on the number of units demanded per customer. As the lead time increases, Customer tend to order fewer units each per unit of time.	BE

impact_of_supplier_network_on_wom_mult	The impact of the Supplier Network on the 'wom mult'. In other words, the ratio of the 'wom mult' to what the 'wom mult' WOULD BE in the absence of a Supplier Network.	BE
impact_on_PE_mult	The impact of 'tot inv' on the PE multiplier. Alternatively, this can be thought of as the ratio of the PE multiplier to what it WOULD BE if the firm took no brand-building, outsourcing, CST-improving, or knowledge-selling actions.	BE
improving_CST	The rate at which Customer Support Technology is improved by the firm.	ND
KoC_obsolescing	The rate at which the firm's knowledge of its Customers becomes obsolete or otherwise worthless.	ND
KoC_per_transaction	The Knowledge of Customers gained per unit transacted.	BE
lead_time	The average time that elapses between the sale of a unit and the time of its delivery.	CR
losing_Customers	The rate at which the firm loses Customers.	CR
losing_Employees	The rate at which the firm loses Employees.	CR
losing_Employees	The rate at which the firm loses Employees.	CR
losing_Fixed_Assets	The rate at which the firm loses Fixed Assets, for whatever reason.	CR
losing_supplier_network	The rate at which Suppliers are lost from the Supplier Network.	CR
margin/unit_of_KoC_sold	The profits earned per unit of Knowledge of Customers sold.	CR, BE
market_value	The market value of the firm, in dollars.	CR, BE
net_earnings	The gross revenues (earnings) of the firm minus the firm's spending.	CR
PE_mult	The actual PE ratio of the firm.	CR
Phys_&_Fin_\$Val	The combined value of the firm's physical and financial assets.	CR
Phys_Asset_\$Val	The value of all physical assets owned by the firm.	CR
potential_selling_of_KoC	The potential rate of selling Knowledge of Customers, whether or not such selling actually occurs.	BE
Price	The price per unit of goods sold by the firm.	CR

profit_margin_internal	The number of dollars earned by the firm per dollar value of each unit sold.	CR
profit_margin_network	The number of dollars earned per dollar value of each unit sold.	CR
selling_KoC	The rate of selling Knowledge of Customers.	CR, BE
Spending	The combined rate of spending on fixed and variable expenses.	CR
suppliers_added_per_Supplier_or_AP_per_time	The number of new Suppliers each current Supplier or Alliance Partner 'recruits' per unit of time.	BE
Supply_from_Network	The capacity the Supplier Network has to supply units to the firm's Customers.	PR, BE
tot_inv	The total number of 'market value'-building activities engaged in by the firm.	CR, BE
total_deliveries	The total rate at which units are delivered to Customers by both the firm and the supplier network combined.	CR
Transactions	The rate at which units are sold.	CR
units_demanded_per_cust	The number of units demanded per customer per time.	CR, BE
wom_mult	The 'word of mouth multiplier' specifies the number of new Customers each current Customer 'recruits' per unit of time.	BE



## Exemplary Equation List with Variable Documentation for Figures 7 and 8

### STOCKS:

$$\text{Alliance\_Partners}(t) = \text{Alliance\_Partners}(t - dt) + (\text{change\_in\_AP}) * dt$$

INIT Alliance\_Partners = 10

DOCUMENT: The number of Alliance Partners the firm has.

$$\text{Avg\_Deliveries}(t) = \text{Avg\_Deliveries}(t - dt) + (\text{chg\_avg}) * dt$$

INIT Avg\_Deliveries = 20000

DOCUMENT: The average rate of delivery of goods by the firm and its Supplier Network.

$$\text{Backlog}(t) = \text{Backlog}(t - dt) + (\text{transactions} - \text{delivering\_by\_network} - \text{delivering\_by\_internal}) * dt$$

INIT Backlog = 10000

DOCUMENT: The number of units which have been ordered but not yet delivered.

$$\text{Brand}(t) = \text{Brand}(t - dt) + (\text{Brand\_building\_from\_sales} + \text{Brand\_building\_from\_brand\_spending} - \text{Brand\_decaying}) * dt$$

INIT Brand = 20

DOCUMENT: This is the amount of Brand recognition of the product.

$$\text{Customers}(t) = \text{Customers}(t - dt) + (\text{gaining\_Customers} - \text{losing\_Customers}) * dt$$

INIT Customers = 1000

DOCUMENT: The number of Customers who purchase from the firm.

$$\text{Customer\_Support\_Technology}(t) = \text{Customer\_Support\_Technology}(t - dt) + (\text{improving\_CST} - \text{CST\_obsolescing}) * dt$$

INIT Customer\_Support\_Technology = 0

DOCUMENT: The quality of the firm's Customer Support Technology.

$$\text{Debt}(t) = \text{Debt}(t - dt) + (\text{acquiring\_debt}) * dt$$

INIT Debt = 0

DOCUMENT: The amount of Debt currently held by the firm.

$$\text{Employees}(t) = \text{Employees}(t - dt) + (\text{attracting\_Employees} - \text{losing\_Employees}) * dt$$

INIT Employees = 100

DOCUMENT: The number of Employees in the firm.

$$\text{Fin\_Asset\_}\$ \_ \text{Val}(t) = \text{Fin\_Asset\_}\$ \_ \text{Val}(t - dt) + (\text{gross\_earnings} + \text{acquiring\_paying\_down\_capital} - \text{capital\_investment} - \text{spending}) * dt$$

INIT Fin\_Asset\_\$\_Val = 1e6

DOCUMENT: The financial assets of the firm, measured in dollars.

$\text{Fixed\_Assets}(t) = \text{Fixed\_Assets}(t - dt) + (\text{adding\_Fixed\_Assets} - \text{losing\_Fixed\_Assets}) * dt$

INIT Fixed\_Assets = 20000

DOCUMENT: The amount of Fixed Assets owned by the firm.

$\text{Knowledge\_of\_Customers}(t) = \text{Knowledge\_of\_Customers}(t - dt) + (\text{building\_KoC} - \text{KoC\_obsolescing}) * dt$

INIT Knowledge\_of\_Customers = 20

DOCUMENT: The level of knowledge the firm has about its customers wants, needs, and desires.

$\text{Natural\_Resources\_Available}(t) = \text{Natural\_Resources\_Available}(t - dt) + (-\text{adding\_Fixed\_Assets}) * dt$

INIT Natural\_Resources\_Available = 10000000000

DOCUMENT: The amount of Natural Resources available for producing Fixed Assets.

$\text{Supplier\_Network}(t) = \text{Supplier\_Network}(t - dt) + (\text{building\_supplier\_network} - \text{losing\_supplier\_network}) * dt$

INIT Supplier\_Network = 0

DOCUMENT: The number of Suppliers to which the firm can outsource to supply its product.

$\text{Working\_Public}(t) = \text{Working\_Public}(t - dt) + (\text{losing\_Employees} - \text{attracting\_Employees}) * dt$

INIT Working\_Public = 900

DOCUMENT: The number of potential Employees who are not currently employed by the firm.

#### USER INPUTS:

Brand\_spending = 0

DOCUMENT: The rate of spending on building Brand name.

CST\_spending = 0

DOCUMENT: The rate of spending on Customer Support Technology.

Outsource\_to\_Supplier\_Network = 0

DOCUMENT: This element of the model is used to toggle Outsourcing to Supplier Network on and off.

sell\_KoC\_switch = 0

DOCUMENT: This factor equals '1' when the firm sells its accumulated Knowledge of Customers, '0' otherwise.

Traditional\_Firm = 0

DOCUMENT: This element equals '1' if the firm does not engage in outsourcing activities, '0' otherwise.

**OTHER VARIABLES:**

Ability\_to\_Attract\_&\_Retain = GRAPH(Fin\_Asset\_\$\_Val)  
 (0.00, 0.05), (500000, 0.15), (1e+006, 1.00), (1.5e+006, 3.10), (2e+006, 5.75),  
 (2.5e+006, 6.75), (3e+006, 7.45), (3.5e+006, 7.80), (4e+006, 8.05), (4.5e+006,  
 8.25), (5e+006, 8.25)

DOCUMENT: The ability of the firm to attract and retain Employees.

acquiring\paying\_down\_capital = acquiring\_debt+buying\_back\selling\_equity

DOCUMENT: The rate, in dollars per year, at which capital is acquired or paid down.

acquiring\_debt = (1000000-Fin\_Asset\_\$\_Val)/.25

DOCUMENT: This is the rate of acquiring Debt.

a d d i n g \_ F i x e d \_ A s s e t s = ( 1 -  
 Outsource\_to\_Supplier\_Network)\*losing\_Fixed\_Assets+cap\_adjust

DOCUMENT: The rate at which the firm acquires Fixed Assets.

APs\_added\_per\_Supplier\_or\_Employee\_per\_time = 0.2

DOCUMENT: The number of new Alliance Partners each current Employee 'recruits' per unit of time.

Attracting\_Employees = (2/90) \* Ability\_to\_Attract\_&\_Retain \* Working\_Public

DOCUMENT: The rate at which the firm gains Employees.

base\_KoC\_per\_transaction = 5/20000

DOCUMENT: This is the base amount of Knowledge of Customers gained per transaction. The quality of the firm's Customer Support Technology modifies this factor to determine the actual amount of knowledge gained per transaction.

base\_PE\_mult = 12.5

DOCUMENT: The base price to earning ratio of the firm.

base\_wom = .2

DOCUMENT: The base 'word of mouth' multiplier (i.e., number of new Customers each current Customer 'recruits' per unit of time). This number is modified by several other factors to determine the actual 'wom mult'.

book\_value = (Equity/1E6)

DOCUMENT: The equity of the firm, in millions of dollars.

Brand\_building\_from\_brand\_spending = Brand\_spending\*Brand\_built\_per\_\$

DOCUMENT: The rate at which Brand recognition is built as a result of spending on Brand-building.

Brand\_building\_from\_sales = 5\*transactions/20000

DOCUMENT: This is the rate at which Brand recognition is built as a result of selling the product.

Brand\_built\_per\_\$ = GRAPH(Knowledge\_of\_Customers)  
 (0.00, 0.00), (10.0, 0.45), (20.0, 2.00), (30.0, 4.50), (40.0, 7.95), (50.0, 10.9),  
 (60.0, 13.7), (70.0, 15.5), (80.0, 16.9), (90.0, 17.8), (100, 17.8)

DOCUMENT: The non-linear degree to which the rate of Brand-building per \$k spent depends on Knowledge of Customers. Firm's with a low Knowledge of their Customers will gain less brand recognition per \$k spent than firm's with a high Knowledge of their Customers.

Brand\_decaying = Brand/4

DOCUMENT: Brand recognition fades with time. This is the rate of losing Brand recognition.

building\_KoC = transactions \* KoC\_per\_transaction

DOCUMENT: The rate at which the firm builds Knowledge of its Customers.

building\_supplier\_network = (Alliance\_Partners+Supplier\_Network) \*  
 suppliers\_added\_per\_Supplier\_or\_AP\_per\_time

DOCUMENT: The rate at which new suppliers are added to the firm's supplier network.

buying\_back\selling\_equity = 0

DOCUMENT: The rate, measured in dollars per year, at which equity is bought or sold.

cap\_adjust = Fixed\_Asset\_shortfall\*Traditional\_Firm

DOCUMENT: When 'Traditional Firm' equals '1', this element equals the Fixed Asset shortfall.

cap\_util = GRAPH(lead\_time)

(0.00, 0.00), (0.05, 0.095), (0.1, 0.205), (0.15, 0.325), (0.2, 0.42), (0.25, 0.53),  
 (0.3, 0.64), (0.35, 0.78), (0.4, 0.86), (0.45, 0.94), (0.5, 1.00), (0.55, 1.03), (0.6,  
 1.05)

DOCUMENT: The degree of utilization of the firm's production capacity.

capital\_investment = adding\_Fixed\_Assets\*200

DOCUMENT: The rate of spending on adding Fixed Assets.

c h a n g e \_ i n \_ A P =  
 (Employees\*APs\_added\_per\_Supplier\_or\_Employee\_per\_time) -  
 Alliance\_Partners/5

DOCUMENT: The rate at which Alliance Partners are added (when positive) or lost (when negative).

chg\_avg = total\_deliveries-Avg\_Deliveries

DOCUMENT: The rate of change in the average rate of delivery by the firm and its Supplier Network.

$CST\_obsolescing = Customer\_Support\_Technology/2$

DOCUMENT: The rate at which Customer Support Technology obsolesces or otherwise loses its functional value.

$cust\_loss\_frac = GRAPH(Knowledge\_of\_Customers)$

(0.00, 0.4), (10.0, 0.275), (20.0, 0.2), (30.0, 0.15), (40.0, 0.123), (50.0, 0.1), (60.0, 0.0875), (70.0, 0.075), (80.0, 0.0675), (90.0, 0.0625), (100, 0.055)

DOCUMENT: The fraction of current Customers lost per unit of time. This fraction decreases non-linearly as the firm's Knowledge of its Customers increases.

$debt\_service = Debt*.1$

DOCUMENT: The amount of interest accumulated by the current Debt per unit of time.

$delivering\_by\_internal = Fixed\_Assets*cap\_util$

DOCUMENT: The rate at which the firm delivers units.

$delivering\_by\_network = \min(Fixed\_Asset\_shortfall, Supply\_from\_Network)$

DOCUMENT: The rate at which the supplier network delivers units.

$earnings\_from\_sales\_of\_KoC = (selling\_KoC*margin/unit\_of\_KoC\_sold)$

DOCUMENT: The revenues from selling Knowledge of Customers per unit of time.

$Equity = Phys\_ \& \_Fin\_ \$Val - Debt$

DOCUMENT: The combined value of the firm's physical and financial assets minus the amount of Debt held by the firm.

$Fixed\_Asset\_shortfall = (2*Backlog - Fixed\_Assets)$

DOCUMENT: The shortfall in amount of Fixed Assets necessary to eliminate the sales backlog.

$fixed\_costs = Fixed\_Assets*20$

DOCUMENT: The cost of maintaining the current base of Fixed Assets.

$gaining\_Customers = Customers*wom\_mult$

DOCUMENT: The rate at which the firm gains new customers.

$gross\_earnings =$

$(price*delivering\_by\_internal*profit\_margin\_internal) + (price*delivering\_by\_network*profit\_margin\_network) + earnings\_from\_sales\_of\_KoC$

DOCUMENT: The gross earnings of the firm, measured in dollars per year.

$impact\_of\_Brand\_on\_wom = GRAPH(Brand)$

(0.00, 0.5), (50.0, 0.75), (100, 1.00), (150, 1.20), (200, 1.38), (250, 1.55), (300, 1.65), (350, 1.73), (400, 1.78), (450, 1.83), (500, 1.85)

DOCUMENT: The impact of Brand recognition on the 'wom mult.'

$\text{impact\_of\_CST\_on\_KoC\_per\_transaction} = \text{GRAPH}(\text{Customer\_Support\_Technology})$   
 (0.00, 0.65), (10.0, 0.95), (20.0, 1.23), (30.0, 1.55), (40.0, 1.85), (50.0, 2.10),  
 (60.0, 2.27), (70.0, 2.48), (80.0, 2.65), (90.0, 2.80), (100, 2.93)

DOCUMENT: The impact of the firm's Customer Support Technology on the Knowledge of Customers gained per transaction.

$\text{impact\_of\_cust\_relations} = \text{GRAPH}(\text{Knowledge\_of\_Customers})$   
 (0.00, 0.4), (10.0, 0.625), (20.0, 1.00), (30.0, 1.38), (40.0, 1.73), (50.0, 2.10),  
 (60.0, 2.43), (70.0, 2.68), (80.0, 2.85), (90.0, 3.00), (100, 3.00)

DOCUMENT: The non-linear impact of the firm's Knowledge of Customers on the number of units demanded per customer per time.

$\text{impact\_of\_KoC\_on\_wom} = \text{GRAPH}(\text{Knowledge\_of\_Customers})$   
 (0.00, 0.00), (10.0, 0.51), (20.0, 1.00), (30.0, 1.30), (40.0, 1.52), (50.0, 1.70),  
 (60.0, 1.85), (70.0, 1.93), (80.0, 1.98), (90.0, 1.99), (100, 2.00)

DOCUMENT: This determines the impact that the firm's Knowledge of Customers has on the 'wom mult'.

$\text{impact\_of\_lead\_time\_on\_sales} = \text{GRAPH}(\text{lead\_time})$   
 (0.00, 1.24), (0.1, 1.22), (0.2, 1.19), (0.3, 1.13), (0.4, 1.07), (0.5, 1.00), (0.6,  
 0.93), (0.7, 0.83), (0.8, 0.71), (0.9, 0.51), (1, 0.00)

DOCUMENT: The non-linear impact that lead time has on the number of units demanded per customer. As the lead time increases, Customer tend to order fewer units each per unit of time.

$\text{impact\_of\_supplier\_network\_on\_wom\_mult} = \text{GRAPH}(\text{Supplier\_Network}/10000)$   
 (0.00, 1.00), (1.00, 1.00), (2.00, 1.16), (3.00, 1.31), (4.00, 1.46), (5.00, 1.59),  
 (6.00, 1.71)

DOCUMENT: The impact of the Supplier Network on the 'wom mult'. In other words, the ratio of the 'wom mult' to what the 'wom mult' WOULD BE in the absence of a Supplier Network.

$\text{impact\_on\_PE\_mult} = \text{GRAPH}(\text{tot\_inv})$   
 (0.00, 1.00), (1.00, 1.34), (2.00, 1.74), (3.00, 2.23), (4.00, 3.00)

DOCUMENT: The impact of 'tot inv' on the PE multiplier. Alternatively, this can be thought of as the ratio of the PE multiplier to what it WOULD BE if the firm took no brand-building, outsourcing, CST-improving, or knowledge-selling actions.

$\text{improving\_CST} = (\text{CST\_spending}) * 0.5$

DOCUMENT: The rate at which Customer Support Technology is improved by the firm.

$\text{KoC\_obsolescing} = \text{Knowledge\_of\_Customers}/4$

DOCUMENT: The rate at which the firms knowledge of its Customers becomes obsolete or otherwise worthless.

$\text{KoC\_per\_transaction} = \text{base\_KoC\_per\_transaction} * \text{impact\_of\_CST\_on\_KoC\_per\_transaction}$

impact\_of\_CST\_on\_KoC\_per\_transaction

DOCUMENT: The Knowledge of Customers gained per unit transacted.

lead\_time = Backlog/Avg\_Deliveries

DOCUMENT: The average time that elapses between the sale of a unit and the time of its delivery.

losing\_Customers = Customers\*cust\_loss\_frac\*1.15

DOCUMENT: The rate at which the firm loses Customers.

losing\_Employees = (0.2/Ability\_to\_Attract\_&\_Retain) \* Employees

DOCUMENT: The rate at which the firm loses Employees.

losing\_Fixed\_Assets = Fixed\_Assets/10

DOCUMENT: The rate at which the firm loses Fixed Assets, for whatever reason.

losing\_supplier\_network = Supplier\_Network/2

DOCUMENT: The rate at which Suppliers are lost from the Supplier Network.

margin\unit\_of\_KoC\_sold = 10000

DOCUMENT: The profits earned per unit of Knowledge of Customers sold.

market\_value = (max(PE\_mult\*net\_earnings,.7\*Equity))/1E6

DOCUMENT: The market value of the firm, in millions of dollars.

net\_earnings = gross\_earnings-spending

DOCUMENT: The gross revenues (earnings) of the firm minus the firm's spending.

PE\_mult = base\_PE\_mult\*impact\_on\_PE\_mult

DOCUMENT: The actual PE ratio of the firm.

Phys\_&\_Fin\_\$Val = Fin\_Asset\_\$Val + Phys\_Asset\_\$Val

DOCUMENT: The combined value of the firm's physical and financial assets.

Phys\_Asset\_\$Val = Fixed\_Assets\*200

DOCUMENT: The value of all physical assets owned by the firm.

potential\_selling\_of\_KoC = GRAPH(Knowledge\_of\_Customers)

(0.00, 0.00), (10.0, 0.00), (20.0, 0.00), (30.0, 8.00), (40.0, 23.0), (50.0, 37.0), (60.0, 52.0), (70.0, 74.0), (80.0, 85.0), (90.0, 91.5), (100, 93.5)

DOCUMENT: The potential rate of selling Knowledge of Customers, whether or not such selling actually occurs.

price = 100

DOCUMENT: The price per unit of goods sold by the firm.

profit\_margin\_internal = .4

DOCUMENT: The number of dollars earned by the firm per dollar value of each

unit sold.

profit\_margin\_network = .2

DOCUMENT: The number of dollars earned per dollar value of each unit sold.

selling\_KoC = potential\_selling\_of\_KoC\*sell\_KoC\_switch

DOCUMENT: The rate of selling Knowledge of Customers.

spending = building\_supplier\_network + fixed\_costs +  
(CST\_spending+Brand\_spending)\*1000+debt\_service

DOCUMENT: The combined rate of spending on fixed and variable expenses.

suppliers\_added\_per\_Supplier\_or\_AP\_per\_time = 1.25

DOCUMENT: The number of new Suppliers each current Supplier or Alliance Partner 'recruits' per unit of time.

Supply\_from\_Network = Supplier\_Network

DOCUMENT: The capacity the Supplier Network has to supply units to the firm's Customers.

tot\_inv = SWITCH(Brand\_spending,0) + SWITCH(CST\_spending,0) +  
Outsource\_to\_Supplier\_Network + sell\_KoC\_switch

DOCUMENT: The total number of 'market value'-building activities engaged in by the firm.

total\_deliveries = delivering\_by\_internal + delivering\_by\_network

DOCUMENT: The total rate at which units are delivered to Customers by both the firm and the supplier network combined.

transactions = Customers\*units\_demanded\_per\_cust

DOCUMENT: The rate at which units are sold.

u n i t s \_ d e m a n d e d \_ p e r \_ c u s t =  
20\*impact\_of\_lead\_time\_on\_sales\*impact\_of\_cust\_relations

DOCUMENT: The number of units demanded per customer per time.

wom\_mult = base\_wom\* impact\_of\_Brand\_on\_wom\*i  
mpact\_of\_supplier\_network\_on\_wom\_mult\* impact\_of\_KoC\_on\_wom

DOCUMENT: The 'word of mouth multiplier' specifies the number of new Customers each current Customer 'recruits' per unit of time.



### Variable Definitions and Equation Notes for Other Embodiments of Systems Dynamics Simulation

#### Key for Exemplary Data Sources

- ND** **Needs Defining** (requires conceptual clarification before seeking data)
- NP** **Needs Proxy** (abstract variable that needs real-world equivalent)
- CR** **Company Records** (company-specific data, but should be available)
- PR** **Public Records** (includes industry averages)
- BE** **Best Estimate** (variable that is not captured and/or measurable; proxy unlikely; correlation analysis may be useful)
- X** **Not applicable** to this embodiment or involves direct user input

Variable Name	Description	Data Source
<b>STOCKS:</b>		
Ability_to_Attract_&_Retain	The ability of the firm to attract new employees and keep current employees. This is on a scale of 0 (no ability whatsoever) to 100 (couldn't be more able to).	ND, NP
Init	The initial value of the stock.	
Ability_to_Train	The ability of a firm to train its employees. It is on a 0 (it can't train) to 100 (couldn't be more able to train) scale.	ND, NP
	The initial value of the stock.	
	Number of strategic partners for R&D, marketing, etc.	ND
	The initial value of the stock.	
	Measures brand recognition on a scale of 0-100%.	ND, NP
	The initial value of the stock.	
Init	The total buying population that is not currently a customer of the firm.	PR
Alliance Partners	The initial value of the stock.	
Init	The accumulated auxiliary sales.	CR
Brand	The initial value of the stock.	
Init	This is the sum of information gathered from all transactions.	CR, BE
Buying Public	The initial value of the stock.	

Init	Measures strength of customer relationship on a scale from 0-100%.	ND
Cume Aux Sales	The initial value of the stock.	
Init	The quality of the firm's customer support system.	ND
Init	The initial value of the stock.	
Debt	Total firm debt.	CR
Init	The initial value of the stock.	
Experienced_Employees	The stock of employees who have been with the firm a significant amount of time.	ND, CR
Init	The initial value of the stock.	
Fixed_Assets	Measure of functional, on-line capital goods used to make finished units.	ND, CR
Init	The initial value of the stock.	
Inventory	Amount of finished goods available for delivery.	CR
Init	The initial value of the stock.	
Investing_Public	The number of potential investors not currently investing with the firm.	PR, BE
Init	The initial value of the stock.	
Investment_Transaction_Data	The amount of relevant transaction data a firm holds.	ND, NP
Init	The initial value of the stock.	
Investors	Number of people who are currently invested in the firm.	CR
Init	The initial value of the stock.	
Knowledge_of_Customers	Measures the firm's knowledge of their customer's needs and preferences on a scale from 0% (no knowledge) to 100% (essentially 'omniscient').	ND, NP
Init	The initial value of the stock.	
Knowledge_of_Investors	The Knowledge of Investors a Firm has. This is on a 0 (no knowledge) to 100 (omniscient) scale.	ND, NP
Init	The initial value of the stock.	
Loyal_customers	The number of customers who have been with the firm long enough to be	ND, CR
Init	The initial value of the stock.	
Natural_Resources_Available	The total amount of resources available that the firm could bring on as fixed assets.	ND, PR
Init	The initial value of the stock.	
Network_Contacts	Contacts gained and lost through the Supplier Network.	ND
Init	The initial value of the stock.	
New Customers	The number of customers just acquired	ND, CR

Init	The initial value of the stock.	
New_Hires	The stock of new employees. In this simplified model, it is assumed that New Hires do not leave without becoming Experienced Employees first.	ND, CR
Init	The initial value of the stock.	
Organizational_Knowledge	The total amount of knowledge the firm has concerning its organization.	ND
Init	The initial value of the stock.	
Outstanding_Shares	Outstanding shares that have been sold to the market.	CR
Init	The initial value of the stock.	
Process_Knowledge	The amount of Process Knowledge a firm has about its core processes.	ND
Init	The initial value of the stock.	
Production_Data	Data collected regarding a firm's production experience.	ND, NP
Init	The initial value of the stock.	
Relationship_with_Investors	The strength of the firm's relationship with its investors. It is on a 0 (no relationship) to 100 (couldn't be stronger) scale.	ND
Init	The initial value of the stock.	
Requests_Backlog	The current level of unfilled orders.	CR
Init	The initial value of the stock.	
Supplier_Network	The number of suppliers for the firm.	CR, BE
Init	The initial value of the stock.	
Technology	The level of Technology within the firm	ND
Init	The initial value of the stock.	
Working_Public	The working population not employed by the firm	ND, PR
Init	The initial value of the stock.	
<b>USER INPUTS:</b>		
sell_units	This is a switch signifying a firm's	X
supplier_investment	The amount of investment in the supplier network for a given time period (in dollars).	CR
selling_price	The price the firm charges for each transaction.	CR
tech_spending	The amount of investment in technology requested in a given time period.	ND, CR
CST_spending	Spending on Customer Support Technology for a given time period.	ND, CR
customer_investing	Total amount of investment in the customer sector	ND, CR

debt_equity_ratio	This is the debt equity ratio the firm can choose.	CR
FA_investing_cost	The amount of investment on Fixed Assets in a given time period.	ND, CR
investing_in_employees	The amount of money invested in employees for a given time period.	ND, CR
selling_shares	The amount of shares sold by the firm in a given time period.	CR
buy_back_OS	How many (if any) shares the firm chooses to buy back in a given time period.	CR
<b>O T H E R VARIABLES:</b>		
Ability_to_Produce	The total amount the firm could produce if necessary	CR
acquiring\paying_down_capital	The net acquiring and paying down of capital.	CR
acquiring\paying_transactions	The number of transactions calculated from acquiring and paying down capital. This is used to determine how much transaction data is gathered over a given time period.	CR
acquiring_PD	The rate at which Production Data is acquired each time period	ND, CR
acquiring_transaction_data	The amount of transaction data acquired in a given time period.	CR
adding_Channels	The number of channels added in a given time period.	CR
adding_Fixed_Assets	The rate at which the firm adds fixed assets	CR
amount_to_deliver	The amount to deliver is determined through analyzing the Requests Backlog and the Inventory level.	BE
Attracting	The amount of new employees the firm attracts over a given time period.	CR
attracting_investors	The number of Investors a firm attracts over a given time period. This is done through word of mouth in the marketplace.	CR
auxiliary_selling	The rate of auxiliary selling	CR, BE
Average_Cost_of_Producing	This is the average cost of producing one unit.	CR
avg_Fin_A_\$_Val	The average financial assets.	PR
avg_OK	Average Organizational Knowledge.	ND
base_knowledge_per_employee	The base amount of knowledge per employee.	ND, BE

base_APs_added_per_Exp_Emp_per_time	The number of Alliance Partners an experienced employee can add to the firm over a given time period. This is more than what a new hire can add.	BE
base_APs_added_p	The number of Alliance Partners an	BE
base_attract_wom_frac	The base word of mouth fraction is determined solely by the net earnings of the firm.	BE
base_aux_selling	The normal amount of auxiliary selling.	BE
base_CR_building	The base amount of Customer Relationship units built per employee per transaction.	ND, BE
base_demand	The base level of units desired per customer.	CR, BE
base_emp_per_\$	The base number of employees the firm can attract per dollar spent.	BE
base_interest_rate	Base interest rate on Debt.	CR
base_loss_frac	The base loss fraction is determined solely by the net earnings of the firm.	CR, BE
base_loyal_loss_frac	The normal percentage of loyal customers the firm would lose each time period if there was no impact of Customer Relationship.	CR, BE
base_nc_loss_frac	The percentage of New Customers the firm would lose each time period if there were no impact of Customer Relationship	CR, BE
Base_PE_multiplier	How much organization is worth beyond current net earnings.	CR
base_productivity	The base level of productivity in the firm. It is determined from a ratio of total employees (Experienced Employees and New Hires) to fixed assets.	ND
base_retention_time	The average time an Experienced Employee remains with the firm.	CR, BE
base_tech_per_\$_spent	The amount of technology gained per dollar invested.	BE
base_time_to_adj_AAR	Base time it takes to adjust the firm's ability to attract and retain to its potential.	BE
base_time_to_exp	The average time it takes for a New Hire to become an Experienced Employee.	ND
base_time_to_loyal	The average time it takes for a New Customer to become a Loyal Customer.	ND

becoming_Experienced	The number of New Hires who become Experienced Employees in a given time period.	ND
becoming_loyal	The number of New Customers who become loyal in a given time period.	ND
book_value	The firm's book value: The sum of its physical and financial assets.	CR
Borrowing	The act of acquiring Debt.	CR
brand_building	This is the cumulative rate of building of Brand recognition.	ND
brand_building_from_Brand_spending	The amount of brand recognition generated by investing money in developing this recognition.	ND
Brand_building_from_sales	Selling units generates Brand recognition. This converter shows the rate of brand recognition acquired as a result of selling.	ND
brand_built_per_\$k	The amount of brand recognition built per dollar spent. Knowledge of the customer influences this amount.	ND, BE
Brand_built_per_transaction	The brand recognition added per transaction.	ND, BE
brand_decaying	The rate at which Brand Recognition is decaying.	ND, BE
Building	Customer Relationship strength is built through interacting with the customer (through employee transactions). The amount this strength is built up is impacted by the number of Channels, the Supplier Network, the amount of transactions, the strength of Brand, and the Customer Support Technology.	ND
building_backlog	The amount of units ordered each time period	CR
building_KoC	Building knowledge of the firm's customers results from acquiring transaction data. The better the relationship and the stronger the support technology, the more effective the firm will be at generating this knowledge.	ND
building_OK	The rate at which the firm acquires Organizational Knowledge	ND
building_PK	Employees bring (and take away) Production Knowledge as they move into and out of the firm.	ND

building_Rwl	The firm builds its relationship with investors by gaining knowledge of those investors.	ND
building_supplier_network	The number of new suppliers attracted over a given time period.	ND, CR
buying_back	The amount of shares bought back by the firm in a given time period.	CR
c_per_\$	The number channels added per dollar spent.	CR, BE
capital_investment	Expenditures from investing in customers, providers, and physical assets in a given time period.	ND, CR
capital_needed	The firm can analyze its performance and determine what capital (if any) is needed.	X
change_in_AP	The number of Alliance Partners added to the firm each time period.	CR
change_in_ARCDD	The change in a firm's ability to raise capital and do deals. This is determined through a potential (based on Organizational Knowledge) and the amount of time it takes to realize this potential.	ND
change_in_Employees	The net change in the number of employees for a given time period.	CR
change_in_ITD	Change in Investment Transaction Data. As a firm acquires and pays down capital, it gathers transaction data.	ND
changing_AAR	The ability of the firm to raise capital and make deals happen. This is determined from the potential indicated by Organizational Knowledge.	ND
changing_training_ability	The net change in the firm's ability to train.	ND
channel_spending	The amount of investment in developing channels.	CR, BE
Channels	The number of channels a firm has.	CR, BE
Contacts_per_Supplier_added	The number of contacts each supplier brings with them	CR, BE
Contacts_per_Supplier_lost	The number of contacts taken by a supplier when it ceases being a supplier to the firm.	CR, BE
Cost_of_Producing	As Process Knowledge goes up the firm is able to produce one unit at a cheaper cost.	CR

cost_per_FA	The cost of adding one unit of Fixed Assets.	ND
CST_obsolescing	The amount of Customer Support Technology obsolescing each time period.	ND
CST_per_\$	The units of Customer Support gained per dollar spent.	ND, BE
CST_per_OK	The units of Customer Support Technology gained per Organizational Knowledge gained.	ND, BE
debt_service	Spending per unit of time to cover interest accumulated on the firm's Debt.	CR
degrading_Tech	Technology becomes obsolete.	ND, BE
Delivering	The amount of units delivered each time period	CR
Demand	The total units desired per time period. It is a function of the number of customers and the average demand per customer. Loyal customers are assumed to want more in this calculation.	CR, BE
earnings_from_sales_of_KoC	The firm earns money from selling its Knowledge of Customers.	CR, BE
ease_of_building_KoC	The more knowledge the firm has of the customer, the easier it will be to build more knowledge--except near the 100% threshold, where it will become increasingly difficult to add more knowledge, since the firm already has most relevant knowledge.	BE
ease_of_improving_CR	The greater the customer relationship the firm has with customers, the easier it will be to build increase the relationship--except near the 100% threshold, where it will become increasingly difficult to build a stronger relationship, since the firm already would have such a good relationship.	BE
ease_of_locating_channel	The number of channels determines how easy it is for a customer to locate a channel, which impacts the amount of units desired per customer.	BE
effective_price_per_share	The price per share the firm can actually charge.	CR
Equity	The sum of the firm's physical and financial assets minus its Debt.	CR



Fixed_Asset_utilization	The percent utilization of Fixed Assets owned.	CR
fixed_costs	Costs assessed each time period on the firm's Fixed Assets.	CR
frac_Rwl_lost	Fraction of Relationship with Investors lost each time period.	ND, BE
gaining_Contacts	When a supplier comes on board, they bring with them a certain number of contacts the firm will be able to use.	ND, CR
gaining_Customers	The amount of new customers gained over a given time period. The process is a word of mouth process. The more effective the firm is at developing brand recognition, the supplier networks, customer knowledge, and customer relationships, the more customers it can gain. Loyal Customers are assumed to have a higher word of mouth multiplier than New Customers.	CR
gaining_Kol	The rate at which the firm gains knowledge of its investors.	ND, BE
gross_earnings	The gross earnings of the firm for a given time period.	CR
imp_of_CR_on_time_loyal	The impact of Customer Relationship on the time it takes to become loyal.	BE
Imp_of_invest_on_PE_multi	Total impact of investing on the PE multiplier.	BE
imp_of_KoC	The impact of Knowledge of Customer on the ability to improve Customer Support Technology.	BE
imp_of_Rwl_on_price	The impact of the Relationship with Investors on the price per share. The better the relationship, the greater the price per share.	BE
impact_of_AAR_on_attracting	The impact of the ability to attract and retain on getting new employees. The greater the ability, the easier it is to attract.	BE
impact_of_AAR_on_retention	The impact of the ability to attract and retain on keeping Experienced Employees. The greater the ability, the easier it is to retain them.	BE
impact_of_AP_on_sup	The impact of the Alliance Partners on the ability to add suppliers. The more Alliance Partners, the easier it is to add suppliers.	BE

impact_of_ARCDD_on_ch	The impact of the ability to raise capital and do deals on adding channels.	BE
impact_of_ARCDD_on_int_rate	The impact of the firm's ability to raise capital and do deals on the interest rate it will be charged on debt. The greater the firm's ability to RCDD, the lower the interest rate they will be subjected to.	BE
impact_of_ARCDD_on_tech	The impact of the ability to raise capital and do deals on the ability of the firm to improve technology.	BE
impact_of_AT	The impact of a firm's Ability to Train on helping a New Hire become an Experienced Employee. The greater the firm's ability, the faster a New Hire can become an Experienced Employee.	BE
impact_of_AT_on_know_per_emp		BE
impact_of_Brand_on_CR	The impact of Brand recognition on Customer Relationship units built. The greater the recognition, the easier it is to build the relationship.	BE
impact_of_brand_on_wom	The impact of Brand recognition on the word of mouth multipliers for gaining customers.	BE
impact_of_c_inv	The impact of customer investing on the PE multiplier.	BE
impact_of_C_on_CR	The impact of Channels on building Customer Relationship.	BE
impact_of_CR_on_aux_selling	The impact of Customer Relationship on the rate of auxiliary selling. The stronger the relationship, the greater the rate.	BE
impact_of_CR_on_loyal_loss_frac	The impact of Customer Relationship on the percentage of loyal customers who leave each time period.	BE
impact_of_CR_on_new_loss_frac	The impact of Customer Relationship on the percentage of New Customers lost in a given time period.	BE
impact_of_CR_on_wom	The impact of Customer Relationship on the word of mouth multipliers for gaining customers.	BE
impact_of_CST_on_build	The impact of the Customer Support Technology on Customer Relationship units built. The more technology the firm has, the easier it is to build the relationship.	BE

impact_of_CST_on_KoC_building	The impact of Customer Support Technology on building customer knowledge.	BE
impact_of_CST_on_retaining_KoC	The impact of Customer Support Technology on the ability to retain Knowledge of Customers. The better the technology, the easier it is to retain.	BE
impact_of_cust_relationship	The impact of the strength of customer relationship on the number of units desired per customer.	BE
impact_of_e_inv	The impact of employee investing on the PE multiplier.	BE
impact_of_FA_inv	The impact of FA investment on the PE multiplier.	BE
impact_of_ITD_on_Rwl	Impact of Investor Transaction Data on the Relationship with Investors	BE
impact_of_KoC_on_wom	Impact of Knowledge of Customers on word of mouth.	BE
impact_of_lead_time_on_units_desired_per_customer	The impact of lead time on the number of units desired per customer.	BE
impact_of_NC_on_time_to_adjust_AAR	Impact of Network Contacts on the time to adjust the Ability to Attract and Retain employees.	BE
impact_of_OK_on_tech	The impact of the organizational knowledge on the ability of the firm to improve technology.	BE
impact_of_PD_on_productivity	The impact of Production Data on internal productivity.	BE
impact_of_PK_on_build_SN	The impact of Process Knowledge on a firm's ability to build its supplier network. The more knowledge, the easier it is to build this network.	BE
impact_of_Relationship_building_on_Koc	The impact of Customer Relationship on building customer knowledge.	BE
impact_of_RI_on_attracting	The impact of Relationship with Investors on the ability to attract new investors. The greater the relationship, the easier it is to attract new investors.	BE
impact_of_RI_on_changing_in_ITD	The impact of Relationship with Investors on the ability to gather transaction data. The greater the relationship, the easier it is to get data.	BE
impact_of_RI_on_loosing	The impact of Relationship with Investors on the ability to keep investors. The greater the relationship, the easier it is to retain new investors.	BE

impact_of_SN_on_AP	Impact of the Supplier Network on the ability to add Alliance Partners	BE
impact_of_SN_on_ch	The impact of the supplier network on the number of channels added.	BE
impact_of_SN_on_CR_building	The impact of the Supplier Network on Customer Relationship units built. The more suppliers the firm has, the easier it is to build the relationship.	BE
impact_of_SN_on_gC	The impact of the Supplier Network on the word of mouth multipliers for gaining customers.	BE
impact_of_SN_on_SN	The impact of the Supplier Network on the firm's ability to attract more suppliers. The more suppliers a firm has, the easier it is assumed to be to attract more suppliers.	BE
impact_of_sup_inv	The impact of supplier investing on the PE multiplier.	BE
impact_of_TD	The impact of Transaction Data on Customer Relationship units built. The more data the firm has, the easier it is to build the relationship.	BE
impact_of_Technology_on_productivity	The impact of Technology on internal productivity.	BE
impact_of_ts	The impact of tech spending on the PE multiplier.	BE
improving_Tech	The amount the firm's technology is improved in a given time period.	ND
interest_rate	The interest rate the firm is charged on its debt.	CR
internal_productivity	Actual internal productivity is determined by base productivity and the impacts of Production Data and Technology.	ND
ITD_per_trans	The amount of transaction data gathered for each transaction.	ND, BE
KoC_obsolescing	An amount of Knowledge of Customers will become obsolete each time period.	ND
Kol_gained_per_TD_gained	Knowledge of Investors gained per Transaction Data gained.	BE
Kol_obsolescence_time	Time Knowledge of Investors remains relevant before obsolescing.	BE
lead_time	The amount of time between taking an order and fulfilling that order.	CR
losing_Aps	Each time period a certain number of Alliance Partners can be lost.	CR
losing_Channels	The number of channels lost in a given time period.	CR

losing_Contacts	When a supplier leaves it takes some contacts with it.	CR, BE
losing_Employees	The rate at which the firm loses Employees.	CR
losing_Fixed_Assets	The rate at which the firm loses Fixed Assets, for whatever reason.	CR
losing_investors	The number of Investors lost over a given time period	CR
losing_ITD	The amount of relevant ITD that loses relevance for a given time period.	ND, BE
losing_Kol	The rate at which the firm loses knowledge of its investors.	ND
losing_loyals	The number of loyal customers lost in a given time period.	CR
losing_new_custs	The number of New Customers who leave in a given time period. The stronger the customer relationship, the fewer should leave.	CR
losing_OK	Each time period a certain amount of Organizational Knowledge will become obsolete.	ND
losing_Rwl	The natural loss of relationship that occurs from atrophy per time period.	ND, BE
losing_supplier_net work	The number of suppliers the firm loses in a given time period.	CR
losing_unfilled_requests	The number of orders lost each time period as customers take their requests away for whatever reason.	CR
Low Cost Position		
Loyal_wom	Loyal Customers will have a greater word of mouth multiplier than New Customers.	BE
marginal_ease_of_building_Brand	As brand is built it becomes more difficult to add further brand recognition. However, a firm with little brand recognition also has great difficulty building its brand name.	BE
marginal_ease_of_imp_Kol	The greater the Knowledge of Investors the firm has, the easier it will be to improve this knowledge--except near the 100% threshold, where it will become increasingly difficult to add more technology, since the firm would already be near the maximum.	BE

marginal_ease_of_improving_CST	The greater the Customer Support Technology the firm has, the easier it will be to improve this technology--except near the 100% threshold, where it will become increasingly difficult to add more technology, since the firm would already be near the maximum.	BE
marginal_ease_of_improving_CST_2	The greater the Customer Support Technology the firm has, the easier it will be to improve this technology--except near the 100% threshold, where it will become increasingly difficult to add more technology, since the firm would already be near the maximum.	BE
market_price_per_share	What the market believes a share is worth. It is calculated by taking the market value and dividing it by Outstanding Shares.	CR
market_value	The firm's market value.	CR
materials_costs	The total cost of materials for production generated over a given time period.	CR
net_earnings	The net earnings of the firm for a given time period.	CR
network_costs	Costs associated with building inventory from the supplier network.	ND, CR
New_wom	New Customers have a lower word of mouth multiplier than Loyal Customers.	BE
obs_time_of_KoC	The amount of time it takes for current customer knowledge to become obsolete.	BE
obsolescence_time_of_OK	The amount of time new Organizational Knowledge remains relevant to the firm.	ND, BE
order_Fixed_Assets	The number of fixed assets ordered by the firm in a given time period.	CR
order_from_network	The units ordered from the supplier network in a given time period.	CR
pay_down_D	The firm can choose to pay down debt.	CR
PD_per_unit_produced	The amount of Production Data generated for each unit produced.	ND, BE
PE_multiplier	Actual worth beyond net earnings.	CR
Phys_&_Fin_\$Val	The value of all physical assets owned by the firm.	CR
PK_obs_time	The length of time Process Knowledge remains relevant.	BE
PK_obsolescing	A certain amount of Process Knowledge becomes obsolete each time period.	BE

PK_per_Employee_ or New Hire	The amount of Process Knowledge each employee has.	BE
PK_per_unit_of_PD _acquired	The amount of Process Knowledge gained for each unit of Production Data acquired.	BE
potential_AAR	Potential Ability to Attract and Retain. It is determined by a firm's assets (financial and knowledge).	BE
potential_AAR_from _Fin_A_\$	The potential ability of a firm to attract and retain based upon its level of Financial Assets. The more assets a firm has relative to the average, the greater is this potential.	BE
potential_ARCDD	The potential ability of the firm to raise capital and do deals, which is determined by the firm's Organizational Knowledge.	BE
potential_AT	The potential ability of a firm to train based upon its level of Organizational Knowledge. The more knowledge a firm has, the greater is the potential for the firm to train.	BE
potential_from_OK	The potential ability of a firm to attract and retain based upon its level of Organizational Knowledge. The more knowledge a firm has relative to the average, the greater is this potential.	BE
price_per_FA	The higher the level of technology, the less it costs to add a unit of Fixed Assets.	CR, BE
price_per_unit_of_K oC sold	The price the firm can charge for each unit of Knowledge of Customer sold.	CR, BE
producing_by_intern al	The amount of inventory generated by the firm in a given time period.	CR
producing_by_netw ork	The number of units added to the inventory by suppliers in a given time period.	CR
Rwl_built_per_unit_ gain in Kol	The amount of sellable Knowledge of Customer units a firm can sell.	ND
Spending	The combined rate of spending by the firm.	CR
supplier_productivity	The amount of units each supplier can produce in a given time period.	CR, PR, BE
suppliers_added_pe r_\$	The number of suppliers gained for each dollar invested in the supplier network.	BE
suppliers_residence time	The length of time a new supplier remains a supplier to the firm.	BE

Supply_available_from_Network	The total units the supplier network is capable of delivering in a given time period.	CR, PR, BE
TD_gained_per_transaction	The amount of Transaction Data gained for a given transaction.	CR, BE
time_an_AP	The amount of time a new Alliance Partner will remain with the firm.	CR, BE
time_to_adj_AT	The time it takes a firm to adjust its actual ability to train to the potential derived from its Organizational Knowledge.	BE
time_to_adjust_AR CDD	Time to adjust Ability to Raise Capital and Do Deals to target level.	BE
total_acquiring\paying_down	Total rate of acquiring and paying down.	CR
total_supply	Supply of units available from firm and supplier network.	CR
Transactions	The total number of transactions in a given time period.	CR
units_demanded_per_cust	The actual number of units desired per customer	CR, BE
units_per_KoC	The amount of sellable units for each unit of Knowledge of Customer. In some firms it may be a 1:1 ratio, in others not.	BE
variable_costs	Expenditures attributable to producing and servicing debt.	CR
Weakening	Customer Relationship doesn't stay built up forever. If nothing is done to try to continue adding to the stock of Customer Relationship, it will weaken.	BE



**Equation List with Variable Documentation  
for Other Embodiments of Systems Dynamic Simulations**

**STOCKS:**

$Ability\_to\_Attract\_ \& \_Retain(t) = Ability\_to\_Attract\_ \& \_Retain(t - dt) + (changing\_AAR) * dt$

INIT  $Ability\_to\_Attract\_ \& \_Retain = 0$  DOCUMENT: The ability of the firm to attract new employees and keep current employees. This is on a scale of 0 (no ability whatsoever) to 100 (couldn't be more able to).

$Ability\_to\_Raise\_Capital\backslash Do\_Deals(t) = Ability\_to\_Raise\_Capital\backslash Do\_Deals(t - dt) + (change\_in\_ARCDD) * dt$

INIT  $Ability\_to\_Raise\_Capital\backslash Do\_Deals = 50$

DOCUMENT: The ability of the firm to raise capital and make deals happen. This is determined from the potential indicated by Organizational Knowledge.

$Ability\_to\_Train(t) = Ability\_to\_Train(t - dt) + (changing\_training\_ability) * dt$

INIT  $Ability\_to\_Train = 50$  DOCUMENT: The ability of a firm to train its employees. It is on a 0 (it can't train) to 100 (couldn't be more able to train) scale.

$Alliance\_Partners(t) = Alliance\_Partners(t - dt) + (change\_in\_AP - losing\_APs) * dt$

INIT  $Alliance\_Partners = 100$  DOCUMENT: Number of strategic partners for R&D, marketing, etc.

$Brand(t) = Brand(t - dt) + (brand\_building - brand\_decaying) * dt$

INIT  $Brand = 20$  DOCUMENT: Measures brand recognition on a scale of 0-100%.

$Buying\_Public(t) = Buying\_Public(t - dt) + (losing\_loyals + losing\_new\_custs - gaining\_Customers) * dt$

INIT  $Buying\_Public = 10000$  DOCUMENT: The total buying population that is not currently a customer of the firm.

$Channels(t) = Channels(t - dt) + (adding\_Channels - losing\_Channels) * dt$

INIT  $Channels = 15$

DOCUMENT: The number of channels a firm has.

$Cume\_Aux\_Sales(t) = Cume\_Aux\_Sales(t - dt) + (auxiliary\_selling) * dt$

INIT  $Cume\_Aux\_Sales = 0$  DOCUMENT: The accumulated auxiliary sales.

$Cume\_Transaction\_Data(t) = Cume\_Transaction\_Data(t - dt) + (acquiring\_transaction\_data) * dt$

INIT  $Cume\_Transaction\_Data = 0$  DOCUMENT: This is the sum of information gathered from all transactions.

$Customer\_Relationship(t) = Customer\_Relationship(t - dt) + (building - weakening) * dt$

INIT Customer\_Relationship = 50DOCUMENT: Measures strength of customer relationship on a scale from 0-100%.

Customer\_Support\_Technology(t) = Customer\_Support\_Technology(t - dt) + (improving\_CST - CST\_obsolescing) \* dt  
 INIT Customer\_Support\_Technology = 0  
 Debt(t) = Debt(t - dt) + (borrowing - paying\_down) \* dt  
 INIT Debt = 0DOCUMENT: Total firm debt.

Experienced\_Employees(t) = Experienced\_Employees(t - dt) + (becoming\_Experienced - losing\_Employees) \* dt  
 INIT Experienced\_Employees = 100DOCUMENT: The stock of employees who have been with the firm a significant amount of time.

Fin\_Asset\_\$\_Val(t) = Fin\_Asset\_\$\_Val(t - dt) + (gross\_earnings + acquiring\paying\_down\_capital - capital\_investment - spending) \* dt  
 INIT Fin\_Asset\_\$\_Val = 1e6DOCUMENT: Total financial assets of the firm.

Fixed\_Assets(t) = Fixed\_Assets(t - dt) + (adding\_Fixed\_Assets - losing\_Fixed\_Assets) \* dt  
 INIT Fixed\_Assets = 20000DOCUMENT: Measure of functional, on-line capital goods used to make finished units.

Inventory(t) = Inventory(t - dt) + (producing\_by\_internal + producing\_by\_network - transactions) \* dt  
 INIT Inventory = 0DOCUMENT: Amount of finished goods available for delivery.

Investing\_Public(t) = Investing\_Public(t - dt) + (losing\_investors - attracting\_investors) \* dt  
 INIT Investing\_Public = 100  
 DOCUMENT: The number of potential investors not currently investing with the firm.

Investment\_Transaction\_Data(t) = Investment\_Transaction\_Data(t - dt) + (change\_in\_ITD - losing\_ITD) \* dt  
 INIT Investment\_Transaction\_Data = 0DOCUMENT: The amount of relevant transaction data a firm holds.

Investors(t) = Investors(t - dt) + (attracting\_investors - losing\_investors) \* dt  
 INIT Investors = 10DOCUMENT: Number of people who are currently invested in the firm.

Knowledge\_of\_Customers(t) = Knowledge\_of\_Customers(t - dt) + (building\_KoC - KoC\_obsolescing) \* dt  
 INIT Knowledge\_of\_Customers = 20DOCUMENT: Measures the firm's knowledge of their customer's needs and preferences on a scale from 0% (no knowledge) to 100% (essentially 'omniscient').

$\text{Knowledge\_of\_Investors}(t) = \text{Knowledge\_of\_Investors}(t - dt) + (\text{gaining\_Kol} - \text{losing\_Kol}) * dt$

INIT Knowledge\_of\_Investors = { Place initial value here... } DOCUMENT: The Knowledge of Investors a Firm has. This is on a 0 (no knowledge) to 100 (omniscient) scale.

$\text{Loyal\_customers}(t) = \text{Loyal\_customers}(t - dt) + (\text{becoming\_loyal} - \text{losing\_loyals}) * dt$

INIT Loyal\_customers = { Place initial value here... } DOCUMENT: The number of customers who have been with the firm long enough to be considered loyal customers. Loyal customers are considered a significant asset to the firm.

$\text{Natural\_Resources\_Available}(t) = \text{Natural\_Resources\_Available}(t - dt) + (-\text{adding\_Fixed\_Assets}) * dt$

INIT Natural\_Resources\_Available = { Place initial value here... } DOCUMENT: The total amount of resources available that the firm could bring on as fixed assets.

$\text{Network\_Contacts}(t) = \text{Network\_Contacts}(t - dt) + (\text{gaining\_Contacts} - \text{losing\_Contacts}) * dt$

INIT Network\_Contacts = { Place initial value here... } DOCUMENT: Contacts gained and lost through the Supplier Network.

$\text{New\_Customers}(t) = \text{New\_Customers}(t - dt) + (\text{gaining\_Customers} - \text{becoming\_loyal} - \text{losing\_new\_custs}) * dt$

INIT New\_Customers = 0 DOCUMENT: The number of customers just acquired.

$\text{New\_Hires}(t) = \text{New\_Hires}(t - dt) + (\text{attracting} - \text{becoming\_Experienced}) * dt$

INIT New\_Hires = 0 DOCUMENT: The stock of new employees. In this simplified model, it is assumed that New Hires do not leave without becoming Experienced Employees first.

$\text{Organizational\_Knowledge}(t) = \text{Organizational\_Knowledge}(t - dt) + (\text{building\_OK} - \text{losing\_OK}) * dt$

INIT Organizational\_Knowledge = 0

DOCUMENT: The total amount of knowledge the firm has concerning it processes, customers, and investors.

$\text{Outstanding\_Shares}(t) = \text{Outstanding\_Shares}(t - dt) + (\text{selling\_shares} - \text{buying\_back}) * dt$

INIT Outstanding\_Shares = 0

DOCUMENT: Outstanding shares that have been sold to the market.

$\text{Process\_Knowledge}(t) = \text{Process\_Knowledge}(t - dt) + (\text{building\_PK} + \text{PK\_migrating} - \text{PK\_obsolescing}) * dt$

INIT Process\_Knowledge = { Place initial value here... }

DOCUMENT: The amount of Process Knowledge a firm has about its core

processes.

$\text{Production\_Data}(t) = \text{Production\_Data}(t - dt) + (\text{acquiring\_PD}) * dt$

INIT  $\text{Production\_Data} = 0$

DOCUMENT: Data collected regarding a firm's production experience.

$\text{Relationship\_with\_Investors}(t) = \text{Relationship\_with\_Investors}(t - dt) + (\text{building\_Rwl} - \text{losing\_Rwl}) * dt$

INIT  $\text{Relationship\_with\_Investors} = 50$

DOCUMENT: The strength of the firm's relationship with its investors. It is on a 0 (no relationship) to 100 (couldn't be stronger) scale.

$\text{Requests\_Backlog}(t) = \text{Requests\_Backlog}(t - dt) + (\text{building\_backlog} - \text{delivering} - \text{losing\_unfilled\_requests}) * dt$

INIT  $\text{Requests\_Backlog} = 0$  DOCUMENT: The current level of unfilled orders.

$\text{Supplier\_Network}(t) = \text{Supplier\_Network}(t - dt) + (\text{building\_supplier\_network} - \text{losing\_supplier\_network}) * dt$

INIT  $\text{Supplier\_Network} = 0$  DOCUMENT: The number of suppliers for the firm.

$\text{Technology}(t) = \text{Technology}(t - dt) + (\text{improving\_Tech} - \text{degrading\_Tech}) * dt$

INIT  $\text{Technology} = 0$  DOCUMENT: The level of Technology within the firm.

$\text{Working\_Public}(t) = \text{Working\_Public}(t - dt) + (\text{losing\_Employees} - \text{attracting}) * dt$

INIT  $\text{Working\_Public} = \{ \text{Place initial value here...} \}$  DOCUMENT: The working population not employed by the firm.

#### USER INPUTS:

$\text{buy\_back\_OS} = \{ \text{Place right hand side of equation here...} \}$

DOCUMENT: How much (if any) shares the firm chooses to buy back in a given time period.

$\text{CST\_spending} = \text{Indicated\_CST\_Spending} * \text{CST\_Spending\_switch}$

DOCUMENT: Spending on Customer Support Technology for a given time period.

$\text{customer\_investing} = \text{brand\_spending} + \text{channel\_spending} + \text{CST\_spending}$

DOCUMENT: Total amount of investment in the customer sector.

$\text{debt\_equity\_ratio} = \{ \text{Place right hand side of equation here...} \}$

DOCUMENT: This is the debt equity ratio the firm can choose.

$\text{FA\_investing\_cost} = \text{adding\_Fixed\_Assets} * \text{price\_per\_FA}$

DOCUMENT: The amount of investment on Fixed Assets in a given time period.

$\text{investing\_in\_employees} = \{ \text{Place right hand side of equation here...} \}$

DOCUMENT: The amount of money invested in employees for a given time period.

sell\_units = { Place right hand side of equation here... }

DOCUMENT: This is a switch signifying a firm's decision to sell units of Knowledge of Customers.

selling\_price = 100

DOCUMENT: The price the firm charges for each transaction.

selling\_shares = capital\_needed\*(-  
debt\_equity\_ratio)/effective\_price\_per\_share

DOCUMENT: The amount of shares sold by the firm in a given time period.

supplier\_investment = { Place right hand side of equation here... }

DOCUMENT: The amount of investment in the supplier network for a given time period (in dollars).

tech\_spending = { Place right hand side of equation here... }

DOCUMENT: The amount of investment in technology requested in a given time period.

#### OTHER VARIABLES:

Ability\_to\_Produce = internal\_productivity

DOCUMENT: The total amount the firm could produce if necessary.

acquiring\paying\_down\_capital = total\_acquiring\paying\_down

DOCUMENT: The net acquiring and paying down of capital.

acquiring\paying\_transactions = borrowing/10 + buying\_back/10 +  
paying\_down/10 + selling\_shares/10

DOCUMENT: The number of transactions calculated from acquiring and paying down capital. This is used to determine how much transaction data is gathered over a given time period.

acquiring\_PD = producing\_by\_internal\*PD\_per\_unit\_produced

DOCUMENT: The rate at which Production Data is acquired each time period.

acquiring\_transaction\_data = transactions\*TD\_gained\_per\_transaction

DOCUMENT: The amount of transaction data acquired in a given time period.

adding\_Channels =

channel\_spending\*c\_per\_\$\*impact\_of\_ARCDD\_on\_ch\*impact\_of\_SN\_on\_ch

DOCUMENT: The number of channels added in a given time period.

adding\_Fixed\_Assets = order\_Fixed\_Assets

DOCUMENT: The rate at which the firm adds fixed assets.

amount\_to\_deliver = MIN(Requests\_Backlog, Inventory)

DOCUMENT: The amount to deliver is determined through analyzing the Requests Backlog and the Inventory level.

attracting =

investing\_in\_employees\*base\_emp\_per\_\$\*impact\_of\_AAR\_on\_attracting

DOCUMENT: The amount of new employees the firm attracts over a given time period.

attracting\_investors =

Investors\*base\_attract\_wom\_frac\*impact\_of\_RI\_on\_attracting

DOCUMENT: The number of Investors a firm attracts over a given time period. This is done through word of mouth in the marketplace.

auxiliary\_selling = base\_aux\_selling\*impact\_of\_CR\_on\_aux\_selling

Average\_Cost\_of\_Producing = { Place right hand side of equation here... }

DOCUMENT: This is the average cost of producing.

avg\_Fin\_A\_\$\_Val = { Place right hand side of equation here... }

DOCUMENT: The average financial assets.

avg\_OK = 50

DOCUMENT: Average Organizational Knowledge.

base\_APs\_added\_per\_Exp\_Emp\_per\_time = { Place right hand side of equation here... }

DOCUMENT: The number of Alliance Partners an experienced employee can add to the firm over a given time period. This is more than what a new hire can add.

base\_APs\_added\_per\_New\_Hire\_per\_time = { Place right hand side of equation here... }

DOCUMENT: The number of Alliance Partners an experienced employee can add to the firm over a given time period.

base\_attract\_wom\_frac = GRAPH(net\_earnings)

(0.00, 0.005), (10.0, 0.035), (20.0, 0.07), (30.0, 0.11), (40.0, 0.15), (50.0, 0.2), (60.0, 0.245), (70.0, 0.315), (80.0, 0.4), (90.0, 0.53), (100, 0.7)

DOCUMENT: The base word of mouth fraction is determined solely by the net earnings of the firm.

base\_aux\_selling = { Place right hand side of equation here... }

DOCUMENT: The normal amount of auxiliary selling.

base\_CR\_building = { Place right hand side of equation here... }

DOCUMENT: The base amount of Customer Relationship units built per

employee per transaction.

base\_demand = 20

DOCUMENT: The base level of units desired per customer.

base\_emp\_per\_\$ = { Place right hand side of equation here... }

DOCUMENT: The base number of employees the firm can attract per dollar spent.

base\_interest\_rate = .1

base\_know\_per\_emp = { Place right hand side of equation here... }

base\_loss\_frac = GRAPH(net\_earnings)

(0.00, 0.6), (10.0, 0.525), (20.0, 0.46), (30.0, 0.39), (40.0, 0.33), (50.0, 0.285), (60.0, 0.225), (70.0, 0.165), (80.0, 0.115), (90.0, 0.07), (100, 0.05)

DOCUMENT: The base loss fraction is determined solely by the net earnings of the firm.

base\_loyal\_loss\_frac = { Place right hand side of equation here... }

DOCUMENT: The normal percentage of loyal customers the firm would lose each time period if there was no impact of Customer Relationship.

base\_nc\_loss\_frac = { Place right hand side of equation here... }

DOCUMENT: The percentage of New Customers the firm would lose each time period if there were no impact of Customer Relationship.

Base\_PE\_multiplier = { Place right hand side of equation here... }

DOCUMENT: How much organization is worth beyond current net earnings.

base\_productivity =

GRAPH((1.5\*Experienced\_Employees+New\_Hires)/Fixed\_Assets)

(0.00, 0.00), (1.00, 8.50), (2.00, 16.0), (3.00, 25.5), (4.00, 35.5), (5.00, 46.0), (6.00, 56.0), (7.00, 67.0), (8.00, 77.5), (9.00, 86.5), (10.0, 97.5)

DOCUMENT: The base level of productivity in the firm. It is determined from a ratio of total employees (Experienced Employees and New Hires) to fixed assets.

base\_retention\_time = { Place right hand side of equation here... }

DOCUMENT: The average time an Experienced Employee remains with the firm.

base\_tech\_per\_\$\_spent = { Place right hand side of equation here... }

DOCUMENT: The amount of technology gained per dollar invested.

base\_time\_to\_adj\_AAR = 2

DOCUMENT: Base time it takes to adjust the firm's ability to attract and retain to its potential.

base\_time\_to\_exp = { Place right hand side of equation here... }

DOCUMENT: The average time it takes for a New Hire to become an Experienced Employee.

base\_time\_to\_loyal = { Place right hand side of equation here... }

DOCUMENT: The average time it takes for a New Customer to become a Loyal Customer.

becoming\_Experienced = (New\_Hires/base\_time\_to\_exp)\*impact\_of\_AT

DOCUMENT: The number of New Hires who become Experienced Employees in a given time period.

becoming\_loyal = (New\_Customers/base\_time\_to\_loyal) \*

imp\_of\_CR\_on\_time\_loyal\*imp\_of\_KoC\_on\_time\_loyal

DOCUMENT: The number of New Customers who become loyal in a given time period.

book\_value = (Equity/1E6)

borrowing = capital\_needed\*debt\_equity\_ratio

brand\_building = marginal\_ease\_of\_building\_Brand \*

(Brand\_building\_from\_sales + brand\_building\_from\_Brand\_spending)

DOCUMENT: This is the cumulative rate of building of Brand recognition.

brand\_building\_from\_Brand\_spending = brand\_spending\*brand\_built\_per\_\$k

DOCUMENT: The amount of brand recognition generated by investing money in developing this recognition.

Brand\_building\_from\_sales = transactions\*Brand\_built\_per\_transaction

DOCUMENT: Selling units generates Brand recognition. This converter shows the rate of brand recognition acquired as a result of selling.

brand\_built\_per\_\$k = GRAPH(Knowledge\_of\_Customers)

(0.00, 0.105), (10.0, 0.645), (20.0, 0.945), (30.0, 1.13), (40.0, 1.26), (50.0, 1.35), (60.0, 1.44), (70.0, 1.48), (80.0, 1.53), (90.0, 1.54), (100, 1.58)

DOCUMENT: The amount of brand recognition built per dollar spent. Knowledge of the customer influences this amount.

Brand\_built\_per\_transaction = { Place right hand side of equation here... }

DOCUMENT: The brand built for a given transaction.

brand\_decaying = Brand/4

DOCUMENT: The rate at which Brand Recognition is decaying.

brand\_spending = 0

DOCUMENT: The amount of money spent on brand building in a given time period.



building =  

$$\text{ease\_of\_improving\_CR} * ((1.5 * \text{Experienced\_Employees} / \text{transactions} * \text{CR\_per\_Employee\_per\_transaction}) + (\text{New\_Hires} / \text{transactions} * \text{CR\_per\_Employee\_per\_transaction}))$$

DOCUMENT: Customer Relationship strength is built through interacting with the customer (through employee transactions). The amount this strength is built up is impacted by the number of Channels, the Supplier Network, the amount of transactions, the strength of Brand, and the Customer Support Technology.

building\_backlog = demand

DOCUMENT: The amount of units ordered each time period.

building\_KoC =  

$$\text{acquiring\_transaction\_data} * \text{ease\_of\_building\_KoC} * \text{impact\_of\_CST\_on\_KoC\_building} * \text{impact\_of\_Relationship\_building\_on\_Koc}$$

DOCUMENT: Building knowledge of the firm's customers results from acquiring transaction data. The better the relationship and the stronger the support technology, the more effective the firm will be at generating this knowledge.

building\_OK =  

$$((\text{Experienced\_Employees} + \text{New\_Hires}) * \text{base\_know\_per\_emp} * \text{impact\_of\_AT\_on\_know\_per\_emp}) + \text{building\_KoC} + \text{building\_PK} + \text{gaining\_Kol}$$

building\_PK =  $\text{acquiring\_PD} * \text{PK\_per\_unit\_of\_PD\_acquired}$

building\_Rwl = { Place right hand side of equation here... }

DOCUMENT: The firm builds its relationship with investors by gaining knowledge of those investors.

building\_supplier\_network =  $\text{supplier\_investment} * \text{suppliers\_added\_per\_\$} * \text{impact\_of\_PK\_on\_build\_SN} * \text{impact\_of\_SN\_on\_SN} * \text{impact\_of\_AP\_on\_sup}$

DOCUMENT: The number of new suppliers attracted over a given time period.

buying\_back =  $\text{paying\_down} * \text{market\_price\_per\_share}$

DOCUMENT: The amount of shares bought back by the firm in a given time period.

c\_per\_\$ = { Place right hand side of equation here... }

DOCUMENT: The number channels added per dollar spent.

capital\_investment =

$\text{customer\_investing} + \text{tech\_spending} + \text{FA\_investing\_cost} + \text{investing\_in\_employees} + \text{supplier\_investment}$  DOCUMENT: Expenditures from investing in customers, providers, and physical assets in a given time period.

capital\_needed = { Place right hand side of equation here... }

DOCUMENT: The firm can analyze its performance and determine what

capital (if any) is needed.

change\_in\_AP =

(Experienced\_Employees\*base\_APs\_added\_per\_Exp\_Emp\_per\_time+New\_Hires\*base\_APs\_added\_per\_New\_Hire\_per\_time) \*impact\_of\_SN\_on\_AP  
DOCUMENT: The number of Alliance Partners added to the firm each time period.

change\_in\_ARCDD = (potential\_ARCDD-

Ability\_to\_Raise\_Capital\Do\_Deals)/time\_to\_adjust\_ARCDD

DOCUMENT: The change in a firm's ability to raise capital and do deals. This is determined through a potential (based on Organizational Knowledge) and the amount of time it takes to realize this potential.

change\_in\_Employees = attracting\_Employees-losing\_Employees

DOCUMENT: The net change in the number of employees for a given time period.

change\_in\_ITD =

acquiring\paying\_transactions\*ITD\_per\_trans\*impact\_of\_RI\_on\_chg\_in\_ITD

DOCUMENT: As a firm acquires and pays down capital, it gathers transaction data.

changing\_AAR = (potential\_AAR-Ability\_to\_Attract\_&\_Retain) /

(base\_time\_to\_adj\_AAR\*impact\_of\_NC\_on\_time\_to\_adjust\_AAR)

changing\_training\_ability = (potential\_AT-Ability\_to\_Train) / time\_to\_adj\_AT

DOCUMENT: The net change in the firm's ability to train.

channel\_spending = 0

DOCUMENT: The amount of investment in developing channels.

Contacts\_per\_Supplier\_added = { Place right hand side of equation here... }

DOCUMENT: The number of contacts each supplier brings with them.

Contacts\_per\_Supplier\_lost = { Place right hand side of equation here... }

DOCUMENT: The number of contacts taken by a supplier when it ceases being a supplier to the firm.

Cost\_of\_Producing = GRAPH(Process\_Knowledge)

(0.00, 97.0), (10.0, 97.0), (20.0, 97.0), (30.0, 96.5), (40.0, 94.0), (50.0, 89.0), (60.0, 79.5), (70.0, 56.0), (80.0, 34.5), (90.0, 22.0), (100, 18.0)

DOCUMENT: As Process Knowledge goes up the firm is able to produce one unit at a cheaper cost.

cost\_per\_FA = { Place right hand side of equation here... }

CR\_per\_Employee\_per\_transaction =

base\_CR\_building\*impact\_of\_Brand\_on\_CR\*impact\_of\_CST\_on\_build\*impact\_of\_C\_on\_CR\*impact\_of\_SN\_on\_CR\_building\*impact\_of\_TD

DOCUMENT: The amount of customer relationship units gained per employee per transaction.

$CST\_obsolescing = Customer\_Support\_Technology/2$

DOCUMENT: The amount of Customer Support Technology obsolescing each time period.

$CST\_per\_\$ = \{ \text{Place right hand side of equation here...} \}$  DOCUMENT: The units of Customer Support gained per dollar spent.

$CST\_per\_OK = \{ \text{Place right hand side of equation here...} \}$

DOCUMENT: The units of Customer Support Technology gained per Organizational Knowledge gained.

$debt\_service = Debt*.1$

$degrading\_Tech = Technology/18 \{months\}$

DOCUMENT: Technology becomes obsolete.

$delivering = amount\_to\_deliver$

DOCUMENT: The amount of units delivered each time period.

$demand =$

$units\_demanded\_per\_cust*(New\_Customers+1.5*Loyal\_customers)$

DOCUMENT: The total units desired per time period. It is a function of the number of customers and the average demand per customer. Loyal customers are assumed to want more in this calculation.

$earnings\_from\_sales\_of\_KoC =$

$sellable\_units\_KoC*price\_per\_unit\_of\_KoC\_sold*sell\_units$  DOCUMENT: The firm earns money from selling its Knowledge of Customers.

$ease\_of\_building\_KoC = GRAPH(Knowledge\_of\_Customers)$

(0.00, 0.00), (10.0, 0.98), (20.0, 1.30), (30.0, 1.40), (40.0, 1.44), (50.0, 1.43), (60.0, 1.40), (70.0, 1.36), (80.0, 1.21), (90.0, 0.87), (100, 0.00)

DOCUMENT: The more knowledge the firm has of the customer, the easier it will be to build more knowledge--except near the 100% threshold, where it will become increasingly difficult to add more knowledge, since the firm already has most relevant knowledge.

$ease\_of\_improving\_CR = GRAPH(Customer\_Relationship)$

(0.00, 0.04), (10.0, 0.44), (20.0, 1.01), (30.0, 1.31), (40.0, 1.47), (50.0, 1.51), (60.0, 1.46), (70.0, 1.37), (80.0, 1.23), (90.0, 1.01), (100, 0.00)

DOCUMENT: The greater the customer relationship the firm has with customers, the easier it will be to build increase the relationship--except near the 100% threshold, where it will become increasingly difficult to build a stronger relationship, since the firm already would have such a good relationship.

$ease\_of\_locating\_channel = GRAPH(Channels)$

(0.00, 0.02), (10.0, 0.045), (20.0, 0.145), (30.0, 0.315), (40.0, 0.615), (50.0, 0.915), (60.0, 1.00), (70.0, 1.00), (80.0, 1.00), (90.0, 1.00), (100, 1.00)

DOCUMENT: The number of channels determines how easy it is for a customer to locate a channel, which impacts the amount of units desired per customer.

$\text{effective\_price\_per\_share} = \text{market\_price\_per\_share} * \text{imp\_of\_Rwl\_on\_price}$

DOCUMENT: The price per share the firm can actually charge.

$\text{Equity} = \text{Phys\_}\&\_\text{Fin\_}\$ \text{Val} - \text{Debt}$

$\text{Fixed\_Asset\_utilization} = \text{GRAPH}(\text{lead\_time})$

(0.00, 36.5), (10.0, 81.5), (20.0, 36.5), (30.0, 36.5), (40.0, 82.5), (50.0, 83.5), (60.0, 73.0), (70.0, 17.0), (80.0, 16.5), (90.0, 56.5), (100, 63.5)

$\text{fixed\_costs} = \text{Fixed\_Assets} * \text{cost\_per\_FA}$

DOCUMENT: Costs assessed each time period on the firm's Fixed Assets.

$\text{frac\_Rwl\_lost} = .1$

DOCUMENT: Fraction of Relationship with Investors lost each time period.

$\text{gaining\_Contacts} = \text{building\_supplier\_network} * \text{Contacts\_per\_Supplier\_added}$

DOCUMENT: When a supplier comes on board, they bring with them a certain number of contacts the firm will be able to use.

$\text{gaining\_Customers} =$

$((\text{Loyal\_customers} * \text{Loyal\_wom} * \text{impact\_of\_CR\_on\_wom} * \text{impact\_of\_SN\_on\_gC} * \text{impact\_of\_brand\_on\_wom} * \text{impact\_of\_KoC\_on\_wom}) + (\text{New\_Customers} * \text{New\_wom} * \text{impact\_of\_CR\_on\_wom} * \text{impact\_of\_SN\_on\_gC} * \text{impact\_of\_brand\_on\_wom} * \text{impact\_of\_KoC\_on\_wom}))$

DOCUMENT: The amount of new customers gained over a given time period. The process is a word of mouth process. The more effective the firm is at developing brand recognition, the supplier networks, customer knowledge, and customer relationships, the more customers it can gain. Loyal Customers are assumed to have a higher word of mouth multiplier than New Customers.

$\text{gaining\_Kol} =$

$\text{change\_in\_ITD} * \text{Kol\_gained\_per\_TD\_gained} * \text{marginal\_ease\_of\_imp\_Kol}$

$\text{gross\_earnings} = \text{selling\_price} * \text{transactions} + \text{earnings\_from\_sales\_of\_KoC}$

DOCUMENT: The gross earnings of the firm for a given time period.

$\text{imp\_of\_CR\_on\_time\_loyal} = \text{GRAPH}(\text{Customer\_Relationship})$

(0.00, 0.34), (10.0, 0.42), (20.0, 0.54), (30.0, 0.68), (40.0, 0.83), (50.0, 1.00), (60.0, 1.13), (70.0, 1.25), (80.0, 1.37), (90.0, 1.43), (100, 1.46)

DOCUMENT: The impact of Customer Relationship on the time it takes to become loyal.

Imp\_of\_invest\_on\_PE\_multi =

impact\_of\_c\_inv\*impact\_of\_e\_inv\*impact\_of\_FA\_inv\*impact\_of\_ts

DOCUMENT: Total impact of investing on the PE multiplier.

imp\_of\_KoC = GRAPH(Knowledge\_of\_Customers)

(0.00, 0.27), (10.0, 0.43), (20.0, 0.52), (30.0, 0.67), (40.0, 0.83), (50.0, 1.00),  
(60.0, 1.21), (70.0, 1.36), (80.0, 1.48), (90.0, 1.55), (100, 1.61)

DOCUMENT: The impact of Knowledge of Customer on the ability to improve Customer Support Technology.

imp\_of\_Rwl\_on\_price = GRAPH(Relationship\_with\_Investors)

(0.00, 0.35), (10.0, 0.42), (20.0, 0.54), (30.0, 0.66), (40.0, 0.83), (50.0, 1.00),  
(60.0, 1.21), (70.0, 1.39), (80.0, 1.51), (90.0, 1.58), (100, 1.60)

DOCUMENT: The impact of the Relationship with Investors on the price per share. The better the relationship, the greater the price per share.

impact\_of\_AAR\_on\_attracting = GRAPH(Ability\_to\_Attract\_&\_Retain)

(0.00, 0.34), (10.0, 0.42), (20.0, 0.54), (30.0, 0.68), (40.0, 0.83), (50.0, 1.00),  
(60.0, 1.13), (70.0, 1.25), (80.0, 1.37), (90.0, 1.43), (100, 1.46)

DOCUMENT: The impact of the ability to attract and retain on getting new employees. The greater the ability, the easier it is to attract.

impact\_of\_AAR\_on\_retention = GRAPH(Ability\_to\_Attract\_&\_Retain)

(0.00, 0.34), (10.0, 0.42), (20.0, 0.54), (30.0, 0.68), (40.0, 0.83), (50.0, 1.00),  
(60.0, 1.13), (70.0, 1.25), (80.0, 1.37), (90.0, 1.43), (100, 1.46)

DOCUMENT: The impact of the ability to attract and retain on keeping Experienced Employees. The greater the ability, the easier it is to retain them.

impact\_of\_AP\_on\_sup = GRAPH(Alliance\_Partners)

(0.00, 0.34), (10.0, 0.42), (20.0, 0.54), (30.0, 0.68), (40.0, 0.83), (50.0, 1.00),  
(60.0, 1.13), (70.0, 1.25), (80.0, 1.37), (90.0, 1.43), (100, 1.46)

DOCUMENT: The impact of the Alliance Partners on the ability to add suppliers. The more Alliance Partners, the easier it is to add suppliers.

impact\_of\_ARCDD\_on\_ch = GRAPH(Ability\_to\_Raise\_Capital\Do\_Deals)

(0.00, 0.37), (10.0, 0.45), (20.0, 0.55), (30.0, 0.67), (40.0, 0.83), (50.0, 1.00),  
(60.0, 1.17), (70.0, 1.32), (80.0, 1.42), (90.0, 1.51), (100, 1.57)

DOCUMENT: The impact of the ability to raise capital and do deals on adding channels.

impact\_of\_ARCDD\_on\_int\_rate =

GRAPH(Ability\_to\_Raise\_Capital\Do\_Deals)

(0.00, 1.77), (10.0, 1.71), (20.0, 1.60), (30.0, 1.46), (40.0, 1.25), (50.0, 1.00),  
(60.0, 0.82), (70.0, 0.6), (80.0, 0.46), (90.0, 0.33), (100, 0.2)

DOCUMENT: The impact of the firm's ability to raise capital and do deals on the interest rate it will be charged on debt. The greater the firm's ability to RCDD, the lower the interest rate they will be subjected to.

impact\_of\_ARCDD\_on\_tech = GRAPH(Ability\_to\_Raise\_Capital\Do\_Deals)

(0.00, 0.34), (10.0, 0.42), (20.0, 0.54), (30.0, 0.68), (40.0, 0.83), (50.0, 1.00), (60.0, 1.13), (70.0, 1.25), (80.0, 1.37), (90.0, 1.43), (100, 1.46)

DOCUMENT: The impact of the ability to raise capital and do deals on the ability of the firm to improve technology.

impact\_of\_AT = GRAPH(Ability\_to\_Train)

(0.00, 0.3), (10.0, 0.38), (20.0, 0.48), (30.0, 0.62), (40.0, 0.82), (50.0, 1.00), (60.0, 1.20), (70.0, 1.38), (80.0, 1.46), (90.0, 1.54), (100, 1.59)

DOCUMENT: The impact of a firm's Ability to Train on helping a New Hire become an Experienced Employee. The greater the firm's ability, the faster a New Hire can become an Experienced Employee.

impact\_of\_AT\_on\_know\_per\_emp = GRAPH(Ability\_to\_Train)

(0.00, 0.34), (10.0, 0.42), (20.0, 0.54), (30.0, 0.68), (40.0, 0.83), (50.0, 1.00), (60.0, 1.13), (70.0, 1.25), (80.0, 1.37), (90.0, 1.43), (100, 1.46)

impact\_of\_Brand\_on\_CR = GRAPH(Brand)

(0.00, 0.5), (10.0, 0.75), (20.0, 1.00), (30.0, 1.20), (40.0, 1.38), (50.0, 1.55), (60.0, 1.65), (70.0, 1.73), (80.0, 1.78), (90.0, 1.83), (100, 1.85)

DOCUMENT: The impact of Brand recognition on Customer Relationship units built. The greater the recognition, the easier it is to build the relationship.

impact\_of\_brand\_on\_wom = GRAPH(Brand)

(0.00, 0.34), (10.0, 0.42), (20.0, 0.54), (30.0, 0.68), (40.0, 0.83), (50.0, 1.00), (60.0, 1.13), (70.0, 1.25), (80.0, 1.37), (90.0, 1.43), (100, 1.46)

DOCUMENT: The impact of Brand recognition on the word of mouth multipliers for gaining customers.

impact\_of\_c\_inv = GRAPH(customer\_investing)

(0.00, 0.39), (10.0, 0.47), (20.0, 0.59), (30.0, 0.74), (40.0, 0.87), (50.0, 1.00), (60.0, 1.10), (70.0, 1.23), (80.0, 1.34), (90.0, 1.45), (100, 1.54)

DOCUMENT: The impact of customer investing on the PE multiplier.

impact\_of\_C\_on\_CR = GRAPH(Channels)

(0.00, 0.34), (10.0, 0.42), (20.0, 0.54), (30.0, 0.68), (40.0, 0.83), (50.0, 1.00), (60.0, 1.13), (70.0, 1.25), (80.0, 1.37), (90.0, 1.43), (100, 1.46)

DOCUMENT: The impact of Channels on building Customer Relationship.

impact\_of\_CR\_on\_aux\_selling = GRAPH(Customer\_Relationship)

(0.00, 0.12), (10.0, 0.14), (20.0, 0.18), (30.0, 0.34), (40.0, 0.5), (50.0, 1.03), (60.0, 1.45), (70.0, 1.70), (80.0, 1.81), (90.0, 1.82), (100, 1.84)

DOCUMENT: The impact of Customer Relationship on the rate of auxiliary selling. The stronger the relationship, the greater the rate.

impact\_of\_CR\_on\_loyal\_loss\_frac = GRAPH(Customer\_Relationship)

(0.00, 1.99), (10.0, 1.68), (20.0, 1.51), (30.0, 1.30), (40.0, 1.16), (50.0, 1.00), (60.0, 0.78), (70.0, 0.56), (80.0, 0.45), (90.0, 0.4), (100, 0.39)

DOCUMENT: The impact of Customer Relationship on the percentage of

loyal customers who leave each time period.

impact\_of\_CR\_on\_nc\_loss\_frac = GRAPH(Customer\_Relationship)  
 (0.00, 1.99), (10.0, 1.68), (20.0, 1.51), (30.0, 1.30), (40.0, 1.16), (50.0, 1.00),  
 (60.0, 0.78), (70.0, 0.56), (80.0, 0.45), (90.0, 0.4), (100, 0.39)

DOCUMENT: The impact of Customer Relationship on the percentage of New Customers lost in a given time period.

impact\_of\_CR\_on\_wom = GRAPH(Customer\_Relationship)  
 (0.00, 0.00), (10.0, 0.51), (20.0, 1.00), (30.0, 1.30), (40.0, 1.52), (50.0, 1.70),  
 (60.0, 1.85), (70.0, 1.93), (80.0, 1.98), (90.0, 1.99), (100, 2.00)

DOCUMENT: The impact of Customer Relationship on the word of mouth multipliers for gaining customers.

impact\_of\_CST\_on\_build = GRAPH(Customer\_Support\_Technology)  
 (0.00, 0.34), (10.0, 0.42), (20.0, 0.54), (30.0, 0.68), (40.0, 0.83), (50.0, 1.00),  
 (60.0, 1.13), (70.0, 1.25), (80.0, 1.37), (90.0, 1.43), (100, 1.46)

DOCUMENT: The impact of the Customer Support Technology on Customer Relationship units built. The more technology the firm has, the easier it is to build the relationship.

impact\_of\_CST\_on\_KoC\_building =  
 GRAPH(Customer\_Support\_Technology)  
 (0.00, 0.34), (10.0, 0.42), (20.0, 0.54), (30.0, 0.68), (40.0, 0.83), (50.0, 1.00),  
 (60.0, 1.13), (70.0, 1.25), (80.0, 1.37), (90.0, 1.43), (100, 1.46)

DOCUMENT: The impact of Customer Support Technology on building customer knowledge.

impact\_of\_CST\_on\_retaining\_KoC =  
 GRAPH(Customer\_Support\_Technology)  
 (0.00, 0.31), (10.0, 0.36), (20.0, 0.45), (30.0, 0.57), (40.0, 0.77), (50.0, 1.00),  
 (60.0, 1.19), (70.0, 1.30), (80.0, 1.39), (90.0, 1.47), (100, 1.51)

DOCUMENT: The impact of Customer Support Technology on the ability to retain Knowledge of Customers. The better the technology, the easier it is to retain.

impact\_of\_cust\_relationship = GRAPH(Customer\_Relationship)  
 (0.00, 0.4), (10.0, 0.625), (20.0, 1.00), (30.0, 1.38), (40.0, 1.73), (50.0, 2.10),  
 (60.0, 2.43), (70.0, 2.68), (80.0, 2.85), (90.0, 3.00), (100, 3.00)

DOCUMENT: The impact of the strength of customer relationship on the number of units desired per customer.

impact\_of\_e\_inv = GRAPH(investing\_in\_employees)  
 (0.00, 0.39), (10.0, 0.47), (20.0, 0.59), (30.0, 0.74), (40.0, 0.87), (50.0, 1.00),  
 (60.0, 1.10), (70.0, 1.23), (80.0, 1.34), (90.0, 1.45), (100, 1.54)

DOCUMENT: The impact of employee investing on the PE multiplier.

impact\_of\_FA\_inv = GRAPH(FA\_investing\_cost)  
 (0.00, 0.39), (10.0, 0.47), (20.0, 0.59), (30.0, 0.74), (40.0, 0.87), (50.0, 1.00),

(60.0, 1.10), (70.0, 1.23), (80.0, 1.34), (90.0, 1.45), (100, 1.54)

DOCUMENT: The impact of FA investment on the PE multiplier.

impact\_of\_ITD\_on\_Rwl = GRAPH(Investment\_Transaction\_Data)

(0.00, 0.44), (10.0, 0.54), (20.0, 0.58), (30.0, 0.68), (40.0, 0.84), (50.0, 1.00),  
(60.0, 1.19), (70.0, 1.30), (80.0, 1.42), (90.0, 1.42), (100, 1.43)

impact\_of\_KoC\_on\_wom = GRAPH(Knowledge\_of\_Customers)

(0.00, 0.34), (10.0, 0.42), (20.0, 0.54), (30.0, 0.68), (40.0, 0.83), (50.0, 1.00),  
(60.0, 1.13), (70.0, 1.25), (80.0, 1.37), (90.0, 1.43), (100, 1.46)

impact\_of\_lead\_time\_on\_units\_desired\_per\_customer = GRAPH(lead\_time)

(0.00, 72.0), (10.0, 69.0), (20.0, 62.0), (30.0, 61.0), (40.0, 61.0), (50.0, 61.0),  
(60.0, 61.0), (70.0, 54.5), (80.0, 53.0), (90.0, 42.0), (100, 0.00)

DOCUMENT: The impact of lead time on the number of units desired per customer.

impact\_of\_NC\_on\_time\_to\_adjust\_AAR = GRAPH(Network\_Contacts)

(0.00, 5.97), (10.0, 5.49), (20.0, 4.98), (30.0, 4.35), (40.0, 3.87), (50.0, 3.45),  
(60.0, 3.06), (70.0, 2.61), (80.0, 2.10), (90.0, 1.71), (100, 1.26)

impact\_of\_OK\_on\_tech = GRAPH(Organizational\_Knowledge)

(0.00, 0.34), (10.0, 0.42), (20.0, 0.54), (30.0, 0.68), (40.0, 0.83), (50.0, 1.00),  
(60.0, 1.13), (70.0, 1.25), (80.0, 1.37), (90.0, 1.43), (100, 1.46)

DOCUMENT: The impact of the organizational knowledge on the ability of the firm to improve technology.

impact\_of\_PD\_on\_productivity = GRAPH(Production\_Data)

(0.00, 0.00), (10.0, 0.00), (20.0, 0.00), (30.0, 0.00), (40.0, 0.00), (50.0, 0.00),  
(60.0, 0.00), (70.0, 0.00), (80.0, 0.00), (90.0, 0.00), (100, 0.00)

DOCUMENT: The impact of Production Data on internal productivity.

impact\_of\_PK\_on\_build\_SN = GRAPH(Process\_Knowledge)

(0.00, 0.34), (10.0, 0.42), (20.0, 0.54), (30.0, 0.68), (40.0, 0.83), (50.0, 1.00),  
(60.0, 1.13), (70.0, 1.25), (80.0, 1.37), (90.0, 1.43), (100, 1.46)

DOCUMENT: The impact of Process Knowledge on a firm's ability to build its supplier network. The more knowledge, the easier it is to build this network.

impact\_of\_Relationship\_building\_on\_Koc = GRAPH(Customer\_Relationship)

(0.00, 0.41), (10.0, 0.45), (20.0, 0.53), (30.0, 0.65), (40.0, 0.82), (50.0, 1.00),  
(60.0, 1.15), (70.0, 1.28), (80.0, 1.39), (90.0, 1.46), (100, 1.50)

DOCUMENT: The impact of Customer Relationship on building customer knowledge.

impact\_of\_RI\_on\_attracting = GRAPH(Relationship\_with\_Investors)

(0.00, 0.37), (10.0, 0.47), (20.0, 0.58), (30.0, 0.67), (40.0, 0.83), (50.0, 1.00),  
(60.0, 1.20), (70.0, 1.34), (80.0, 1.44), (90.0, 1.53), (100, 1.58)

DOCUMENT: The impact of Relationship with Investors on the ability to attract new investors. The greater the relationship, the easier it is to attract new investors.



impact\_of\_RI\_on\_chg\_in\_ITD = GRAPH(Relationship\_with\_Investors)  
 (0.00, 0.33), (10.0, 0.38), (20.0, 0.45), (30.0, 0.58), (40.0, 0.75), (50.0, 1.00),  
 (60.0, 1.23), (70.0, 1.38), (80.0, 1.48), (90.0, 1.56), (100, 1.60)

DOCUMENT: The impact of Relationship with Investors on the ability to gather transaction data. The greater the relationship, the easier it is to get data.

impact\_of\_RI\_on\_losing = GRAPH(Relationship\_with\_Investors)  
 (0.00, 1.57), (10.0, 1.54), (20.0, 1.47), (30.0, 1.34), (40.0, 1.16), (50.0, 1.00),  
 (60.0, 0.79), (70.0, 0.6), (80.0, 0.47), (90.0, 0.37), (100, 0.3)

DOCUMENT: The impact of Relationship with Investors on the ability to keep investors. The greater the relationship, the easier it is to retain new investors.

impact\_of\_SN\_on\_AP = GRAPH(Supplier\_Network)  
 (0.00, 0.34), (10.0, 0.42), (20.0, 0.54), (30.0, 0.68), (40.0, 0.83), (50.0, 1.00),  
 (60.0, 1.13), (70.0, 1.25), (80.0, 1.37), (90.0, 1.43), (100, 1.46)

impact\_of\_SN\_on\_ch = GRAPH(Supplier\_Network)  
 (0.00, 0.26), (10.0, 0.35), (20.0, 0.46), (30.0, 0.57), (40.0, 0.74), (50.0, 1.00),  
 (60.0, 1.30), (70.0, 1.47), (80.0, 1.54), (90.0, 1.58), (100, 1.60)

DOCUMENT: The impact of the supplier network on the number of channels added.

impact\_of\_SN\_on\_CR\_building = GRAPH(Supplier\_Network)  
 (0.00, 0.34), (10.0, 0.42), (20.0, 0.54), (30.0, 0.68), (40.0, 0.83), (50.0, 1.00),  
 (60.0, 1.13), (70.0, 1.25), (80.0, 1.37), (90.0, 1.43), (100, 1.46)

DOCUMENT: The impact of the Supplier Network on Customer Relationship units built. The more suppliers the firm has, the easier it is to build the relationship.

impact\_of\_SN\_on\_gC = GRAPH(Supplier\_Network)  
 (0.00, 0.34), (10.0, 0.42), (20.0, 0.54), (30.0, 0.68), (40.0, 0.83), (50.0, 1.00),  
 (60.0, 1.13), (70.0, 1.25), (80.0, 1.37), (90.0, 1.43), (100, 1.46)

DOCUMENT: The impact of the Supplier Network on the word of mouth multipliers for gaining customers.

impact\_of\_SN\_on\_SN = GRAPH(Supplier\_Network)  
 (0.00, 0.34), (10.0, 0.42), (20.0, 0.54), (30.0, 0.68), (40.0, 0.83), (50.0, 1.00),  
 (60.0, 1.13), (70.0, 1.25), (80.0, 1.37), (90.0, 1.43), (100, 1.46)

DOCUMENT: The impact of the Supplier Network on the firm's ability to attract more suppliers. The more suppliers a firm has, the easier it is assumed to be to attract more suppliers.

impact\_of\_sup\_inv = GRAPH(supplier\_investment)  
 (0.00, 0.39), (10.0, 0.47), (20.0, 0.59), (30.0, 0.74), (40.0, 0.87), (50.0, 1.00),  
 (60.0, 1.10), (70.0, 1.23), (80.0, 1.34), (90.0, 1.45), (100, 1.54)

DOCUMENT: The impact of supplier investing on the PE multiplier.

impact\_of\_TD = GRAPH(Cume\_Transaction\_Data)  
 (0.00, 0.34), (10.0, 0.42), (20.0, 0.54), (30.0, 0.68), (40.0, 0.83), (50.0, 1.00),

(60.0, 1.13), (70.0, 1.25), (80.0, 1.37), (90.0, 1.43), (100, 1.46)

DOCUMENT: The impact of Transaction Data on Customer Relationship units built. The more data the firm has, the easier it is to build the relationship.

impact\_of\_Technology\_on\_productivity = GRAPH(Technology)  
(0.00, 0.00), (10.0, 0.00), (20.0, 0.00), (30.0, 0.00), (40.0, 0.00), (50.0, 0.00),  
(60.0, 0.00), (70.0, 0.00), (80.0, 0.00), (90.0, 0.00), (100, 0.00)

DOCUMENT: The impact of Technology on internal productivity.

impact\_of\_ts = GRAPH(tech\_spending)  
(0.00, 0.39), (10.0, 0.47), (20.0, 0.59), (30.0, 0.74), (40.0, 0.87), (50.0, 1.00),  
(60.0, 1.10), (70.0, 1.23), (80.0, 1.34), (90.0, 1.45), (100, 1.54)

DOCUMENT: The impact of tech spending on the PE multiplier.

improving\_CST = ((CST\_spending\*CST\_per\_\$) +  
(building\_OK\*CST\_per\_OK)) \*

marginal\_ease\_of\_improving\_CST\*imp\_of\_KoC  
improving\_Tech =

tech\_spending\*base\_tech\_per\_\$\_spent\*impact\_of\_ARCDD\_on\_tech\*impact\_of\_OK\_on\_tech

DOCUMENT: The amount the firm's technology is improved in a given time period.

interest\_rate = base\_interest\_rate\*impact\_of\_ARCDD\_on\_int\_rate

DOCUMENT: The interest rate the firm is charged on its debt.

internal\_productivity =  
base\_productivity\*impact\_of\_PD\_on\_productivity\*impact\_of\_Technology\_on\_productivity

DOCUMENT: Actual internal productivity is determined by base productivity and the impacts of Production Data and Technology.

ITD\_per\_trans = { Place right hand side of equation here... }

DOCUMENT: The amount of transaction data gathered for each transaction.

KoC\_obsolescing =  
Knowledge\_of\_Customers/(obs\_time\_of\_KoC\*impact\_of\_CST\_on\_retaining\_KoC)

DOCUMENT: An amount of Knowledge of Customers will become obsolete each time period.

Kol\_gained\_per\_TD\_gained = { Place right hand side of equation here... }

DOCUMENT: Knowledge of Investors gained per Transaction Data gained.

Kol\_obsolescence\_time = { Place right hand side of equation here... }

DOCUMENT: Time Knowledge of Investors remains relevant before obsolescing.

lead\_time = Inventory/total\_supply

DOCUMENT: The amount of time between taking an order and fulfilling that order.

$\text{losing\_APs} = \text{Alliance\_Partners} / \text{time\_an\_AP}$

DOCUMENT: Each time period a certain number of Alliance Partners can be lost.

$\text{losing\_Channels} = \text{Channels} / 5$

DOCUMENT: The number of channels lost in a given time period.

$\text{losing\_Contacts} = \text{losing\_supplier\_network} * \text{Contacts\_per\_Supplier\_lost}$

DOCUMENT: When a supplier leaves it takes some contacts with it.

$\text{losing\_Employees} =$

$\text{Experienced\_Employees} / (\text{base\_retention\_time} * \text{impact\_of\_AAR\_on\_retention})$

$\text{losing\_Fixed\_Assets} = \text{Fixed\_Assets} / 10$

DOCUMENT: The rate at which the firm loses Fixed Assets, for whatever reason.

$\text{losing\_investors} = \text{Investors} * \text{base\_loss\_frac} * \text{impact\_of\_RI\_on\_losing}$

DOCUMENT: The number of Investors lost over a given time period.

$\text{losing\_ITD} = \text{Investment\_Transaction\_Data} / 4$

DOCUMENT: The amount of relevant ITD that loses relevance for a given time period.

$\text{losing\_Kol} = \text{Knowledge\_of\_Investors} / \text{Kol\_obsolescence\_time}$

$\text{losing\_loyals} =$

$\text{Loyal\_customers} * \text{base\_loyal\_loss\_frac} * \text{impact\_of\_CR\_on\_loyal\_loss\_frac} * \text{impact\_of\_KoC\_on\_loyal\_loss\_frac}$

DOCUMENT: The number of loyal customers lost in a given time period.

$\text{losing\_loyals} =$

$\text{Loyal\_customers} * \text{base\_loyal\_loss\_frac} * \text{impact\_of\_CR\_on\_loyal\_loss\_frac} * \text{impact\_of\_KoC\_on\_loyal\_loss\_frac}$

DOCUMENT: The number of loyal customers lost in a given time period.

$\text{losing\_new\_custs} =$

$\text{New\_Customers} * \text{base\_nc\_loss\_frac} * \text{impact\_of\_CR\_on\_loyal\_loss\_frac}$

DOCUMENT: The number of New Customers who leave in a given time period. The stronger the customer relationship, the fewer should leave.

$\text{losing\_new\_custs} =$

$\text{New\_Customers} * \text{base\_nc\_loss\_frac} * \text{impact\_of\_CR\_on\_loyal\_loss\_frac}$

DOCUMENT: The number of New Customers who leave in a given time period. The stronger the customer relationship, the fewer should leave.

losing\_OK = { Place right hand side of equation here... }

DOCUMENT: Each time period a certain amount of Organizational Knowledge will become obsolete.

losing\_Rwl = Relationship\_with\_Investors\*frac\_Rwl\_lost

DOCUMENT: The natural loss of relationship that occurs from atrophy per time period.

losing\_supplier\_network = Supplier\_Network/suppliers\_residence\_time

DOCUMENT: The number of suppliers the firm loses in a given time period.

losing\_unfilled\_requests = Requests\_Backlog/4

DOCUMENT: The number of orders lost each time period as customers take their requests away for whatever reason.

Low\_Cost\_Position = { Place right hand side of equation here... }

Loyal\_wom = { Place right hand side of equation here... }

DOCUMENT: Loyal Customers will have a greater word of mouth multiplier than New Customers.

marginal\_ease\_of\_building\_Brand = GRAPH(Brand)

(0.00, 1.00), (10.0, 1.00), (20.0, 1.00), (30.0, 1.00), (40.0, 1.00), (50.0, 1.00), (60.0, 0.99), (70.0, 0.94), (80.0, 0.81), (90.0, 0.58), (100, 0.00)

marginal\_ease\_of\_imp\_Kol = GRAPH(Knowledge\_of\_Investors)

(0.00, 0.04), (10.0, 0.44), (20.0, 1.01), (30.0, 1.31), (40.0, 1.47), (50.0, 1.51), (60.0, 1.46), (70.0, 1.37), (80.0, 1.23), (90.0, 1.01), (100, 0.00)

DOCUMENT: The greater the Knowledge of Investors the firm has, the easier it will be to improve this knowledge--except near the 100% threshold, where it will become increasingly difficult to add more technology, since the firm would already be near the maximum.

marginal\_ease\_of\_improving\_CST =

GRAPH(Customer\_Support\_Technology)

(0.00, 0.04), (10.0, 0.44), (20.0, 1.01), (30.0, 1.31), (40.0, 1.47), (50.0, 1.51), (60.0, 1.46), (70.0, 1.37), (80.0, 1.23), (90.0, 1.01), (100, 0.00)

DOCUMENT: The greater the Customer Support Technology the firm has, the easier it will be to improve this technology--except near the 100% threshold, where it will become increasingly difficult to add more technology, since the firm would already be near the maximum.

marginal\_ease\_of\_improving\_CST\_2 =

GRAPH(Customer\_Support\_Technology)

(0.00, 0.04), (10.0, 0.44), (20.0, 1.01), (30.0, 1.31), (40.0, 1.47), (50.0, 1.51), (60.0, 1.46), (70.0, 1.37), (80.0, 1.23), (90.0, 1.01), (100, 0.00)

DOCUMENT: The greater the Customer Support Technology the firm has, the easier it will be to improve this technology--except near the 100% threshold, where it will become increasingly difficult to add more technology,

since the firm would already be near the maximum.

$\text{market\_price\_per\_share} = \text{market\_value} / \text{Outstanding\_Shares}$

DOCUMENT: What the market believes a share is worth. It is calculated by taking the market value and dividing it by Outstanding Shares.

$\text{market\_value} = \text{net\_earnings} * \text{PE\_multiplier}$

DOCUMENT: Firm market value.

$\text{materials\_costs} = \text{producing\_by\_internal} * \text{Cost\_of\_Producing}$

DOCUMENT: The total cost of materials for production generated over a given time period.

$\text{net\_earnings} = \text{gross\_earnings} - \text{spending}$

DOCUMENT: The net earnings of the firm for a given time period.

$\text{network\_costs} = \{ \text{Place right hand side of equation here...} \}$

DOCUMENT: Costs associated with building inventory from the supplier network.

$\text{New\_wom} = \{ \text{Place right hand side of equation here...} \}$

DOCUMENT: New Customers have a lower word of mouth multiplier than Loyal Customers.

$\text{obs\_time\_of\_KoC} = 4$

DOCUMENT: The amount of time it takes for current customer knowledge to become obsolete.

$\text{obsolescence\_time\_of\_OK} = \{ \text{Place right hand side of equation here...} \}$

DOCUMENT: The amount of time new Organizational Knowledge remains relevant to the firm.

$\text{order\_Fixed\_Assets} = 0$

DOCUMENT: The number of fixed assets ordered by the firm in a given time period.

$\text{order\_from\_network} = \{ \text{Place right hand side of equation here..} \}$

DOCUMENT: The units ordered from the supplier network in a given time period.

$\text{pay\_down\_D} = \{ \text{Place right hand side of equation here...} \}$

DOCUMENT: The firm can choose to pay down debt.

$\text{paying\_down} = \text{pay\_down\_D}$

$\text{PD\_per\_unit\_produced} = 0$

DOCUMENT: The amount of Production Data generated for each unit produced.

$\text{PE\_multiplier} = \text{Base\_PE\_multiplier} * \text{Imp\_of\_invest\_on\_PE\_multi}$

DOCUMENT: Actual worth beyond net earnings.

$\text{Phys\_}\&\_\text{Fin\_}\$ \text{Val} = \text{Fin\_}\text{Asset\_}\$ \text{Val} + \text{Phys\_}\text{Asset\_}\$ \text{Val}$

$\text{Phys\_}\text{Asset\_}\$ \text{Val} = 200 * \text{Fixed\_}\text{Assets}$

DOCUMENT: The value of all physical assets owned by the firm.

$\text{PK\_migrating} = \text{change\_in\_Employees} * \text{PK\_per\_Employee\_or\_New\_Hire}$

DOCUMENT: Employees bring (and take away) Production Knowledge as they move into and out of the firm.

$\text{PK\_obs\_time} = \{ \text{Place right hand side of equation here...} \}$

DOCUMENT: The length of time Process Knowledge remains relevant.

$\text{PK\_obsolescing} = \text{Process\_Knowledge} / \text{PK\_obs\_time}$

DOCUMENT: A certain amount of Process Knowledge becomes obsolete each time period.

$\text{PK\_per\_Employee\_or\_New\_Hire} = \{ \text{Place right hand side of equation here...} \}$

DOCUMENT: The amount of Process Knowledge each employee has.

$\text{PK\_per\_unit\_of\_PD\_acquired} = \{ \text{Place right hand side of equation here...} \}$

DOCUMENT: The amount of Process Knowledge gained for each unit of Production Data acquired.

$\text{potential\_AAR} = (\text{potential\_AAR\_from\_Fin\_A\_}\$ + \text{potential\_from\_OK}) / 2$

DOCUMENT: Potential Ability to Attract and Retain. It is determined by a firm's assets (financial and knowledge).

$\text{potential\_AAR\_from\_Fin\_A\_}\$ = \text{GRAPH}(\text{Fin\_}\text{Asset\_}\$ \text{Val} / \text{avg\_Fin\_}\text{A\_}\$ \text{Val})$   
 (0.00, 0.00), (0.5, 32.0), (1.00, 50.0), (1.50, 59.5), (2.00, 66.0), (2.50, 71.0),  
 (3.00, 76.0), (3.50, 80.5), (4.00, 84.5), (4.50, 87.0), (5.00, 89.5)

DOCUMENT: The potential ability of a firm to attract and retain based upon its level of Financial Assets. The more assets a firm has relative to the average, the greater is this potential.

$\text{potential\_ARCDD} = \text{GRAPH}(\text{Organizational\_Knowledge})$

(0.00, 0.00), (10.0, 32.0), (20.0, 50.0), (30.0, 59.5), (40.0, 66.0), (50.0, 71.0),  
 (60.0, 76.0), (70.0, 80.5), (80.0, 84.5), (90.0, 87.0), (100, 89.5)

DOCUMENT: The potential ability of the firm to raise capital and do deals, which is determined by the firm's Organizational Knowledge.

$\text{potential\_AT} = \text{GRAPH}(\text{Organizational\_Knowledge})$

(0.00, 0.00), (10.0, 10.0), (20.0, 20.0), (30.0, 30.0), (40.0, 40.0), (50.0, 50.0),  
 (60.0, 60.0), (70.0, 70.0), (80.0, 80.0), (90.0, 90.0), (100, 100)

DOCUMENT: The potential ability of a firm to train based upon its level of Organizational Knowledge. The more knowledge a firm has, the greater is the potential for the firm to train.

potential\_from\_OK = GRAPH(Organizational\_Knowledge/avg\_OK)  
 (0.00, 0.00), (10.0, 32.0), (20.0, 50.0), (30.0, 59.5), (40.0, 66.0), (50.0, 71.0),  
 (60.0, 76.0), (70.0, 80.5), (80.0, 84.5), (90.0, 87.0), (100, 89.5)

DOCUMENT: The potential ability of a firm to attract and retain based upon its level of Organizational Knowledge. The more knowledge a firm has relative to the average, the greater is this potential.

price\_per\_FA = GRAPH(Technology)  
 (0.00, 100), (10.0, 89.5), (20.0, 82.5), (30.0, 73.0), (40.0, 65.0), (50.0, 54.0),  
 (60.0, 45.0), (70.0, 34.0), (80.0, 21.5), (90.0, 9.00), (100, 0.00)

DOCUMENT: The higher the level of technology, the less it costs to add a unit of Fixed Assets.

price\_per\_unit\_of\_KoC\_sold = { Place right hand side of equation here... }

DOCUMENT: The price the firm can charge for each unit of Knowledge of Customer sold.

producing\_by\_internal = Ability\_to\_Produce\*Fixed\_Asset\_utilization

DOCUMENT: The amount of inventory generated by the firm in a given time period.

producing\_by\_network = IF

order\_from\_network<=Supply\_available\_from\_Network THEN

order\_from\_network ELSE Supply\_available\_from\_Network

DOCUMENT: The number of units added to the inventory by suppliers in a given time period.

Rwl\_built\_per\_unit\_gain\_in\_Kol = { Place right hand side of equation here... }

sellable\_units\_KoC = Knowledge\_of\_Customers  
 DOCUMENT: The amount of sellable Knowledge of Customer units a firm can sell.  
 spending = fixed\_costs + variable\_costs  
 supplier\_productivity = { Place right hand side of equation here... }

DOCUMENT: The amount of units each supplier can produce in a given time period.

suppliers\_added\_per\_\$ = { Place right hand side of equation here... }

DOCUMENT: The number of suppliers gained for each dollar invested in the supplier network.

suppliers\_residence\_time = 2

DOCUMENT: The length of time a new supplier remains a supplier to the firm.

Supply\_available\_from\_Network = Supplier\_Network\*supplier\_productivity

DOCUMENT: The total units the supplier network is capable of delivering in a given time period.

TD\_gained\_per\_transaction = { Place right hand side of equation here... }

DOCUMENT: The amount of Transaction Data gained for a given transaction.

time\_an\_AP = { Place right hand side of equation here... }

DOCUMENT: The amount of time a new Alliance Partner will remain with the firm.

time\_to\_adj\_AT = { Place right hand side of equation here... }

DOCUMENT: The time it takes a firm to adjust its actual ability to train to the potential derived from its Organizational Knowledge.

time\_to\_adjust\_ARCDD = { Place right hand side of equation here... }  
total\_acquiring\paying\_down = borrowing+selling\_shares-buying\_back-  
paying\_down

total\_supply = Ability\_to\_Produce + Supply\_available\_from\_Network

transactions = delivering+auxiliary\_selling

DOCUMENT: The total number of transactions in a given time period.

units\_demanded\_per\_cust =

base\_demand\*ease\_of\_locating\_channel\*impact\_of\_cust\_relationship\*impact  
\_of\_lead\_time\_on\_units\_desired\_per\_customer

DOCUMENT: The actual number of units desired per customer.

units\_per\_KoC = { Place right hand side of equation here... }

DOCUMENT: The amount of sellable units for each unit of Knowledge of Customer. In some firms it may be a 1:1 ratio, in others not.

variable\_costs = brand\_spending + CIS\_spending + debt\_service

DOCUMENT: Expenditures attributable to producing and servicing debt.

weakening = Customer\_Relationship/5

DOCUMENT: Customer Relationship doesn't stay built up forever. If nothing is done to try to continue adding to the stock of Customer Relationship, it will weaken.

## Section 7 --- Conclusion

In furtherance of the art, the inventors have devised methods, software, and systems which combine asset allocation information, for example, tangible and intangible assets, and market information to derive an estimate of business market value. The exemplary embodiment classifies tangible assets into physical and financial asset categories and intangible assets into customer and employee asset categories. It also derives four asset-weighting factors from the



market information and applies them to the physical, financial, customer, and employee assets. Other facets of the invention use the four-asset framework to project and visualize market response to real or hypothetical business decisions affecting asset allocations over time. Thus, ultimately the invention provides an effective tool for strategic business management.

The embodiments described above are intended only to illustrate and teach one or more ways of practicing or implementing the present invention, not to restrict its breadth or scope. The actual scope of the invention, which embraces all ways of practicing or implementing the invention, is defined only by the following claims and their equivalents.

### Claims

1. A computer system that estimates how operational decisions in a business are likely to affect its market value, the system comprising:
  - means for representing two or more assets of the business;
  - means for modeling the market value of the business based on the assets;
  - means for representing an effect of one or more operational decisions on one or more of the assets;
  - means for determining a change in the market value based on the effect of one or more operational decisions on one or more of the assets; and
  - means for displaying the asset composition of projected market value.
2. A computer system that estimates how one or more operational decisions of a business are likely to affect its market value, the system comprising:
  - means for capturing quantified information for the business, with the information including balance sheet information and income statement information;
  - means for organizing at least a portion of the balance sheet information and the income statement information into one or more categories of tangible assets and one or more categories of intangible assets;
  - means for determining a contribution of one or more assets in each of the categories to a market value of the business;
  - means for modeling an effect of one or more business decisions on the market value;
  - means for adjusting the modeled effect based on an effect of similar decisions on one or more related businesses; and
  - means for outputting the contribution of the one or more assets in at least one of the categories.
3. A computer system comprising:
  - means for determining a value of one or more tangible assets in a business;
  - means for determining a value of one or more intangible assets in the business;
  - means for combining the value of one or more of the tangible assets and the value of one or more of the intangible assets; and
  - means for providing a visual indication of the combination of values.
4. A data processing method for managing a business comprising:
  - organizing tangible and intangible assets into two or more categories of assets;
  - determining a contribution of one or more assets in each of the categories to a market

value of the business; and  
determining an effect of one or more business decisions on the market value.

5. A computer readable medium having computer executable instructions thereon for causing a computer to perform the method of claim 4.
6. A data processing system for managing a business comprising:  
means for organizing tangible and intangible assets into multiple categories of assets;  
means for determining a market value contribution of each of the categories;  
means for modeling the effect of one or more operational decisions on the market value contribution of at least one of the categories; and  
means for displaying the effect.
7. A data classification scheme for organizing or classifying data relating to tangible and intangible assets, the classification scheme comprising:  
a tangible asset category;  
an employee asset category; and  
a customer asset category.
8. The data classification scheme of claim 7 wherein the tangible asset category includes physical asset data or financial asset data and wherein the data classification scheme includes an organizational asset category.
9. A method of using a data processing system for managing a company comprising:  
organizing tangible and intangible assets into two or more categories of assets;  
processing data regarding assets in other companies to assess relative asset allocations to the two or more categories of assets;  
recalibrating an asset value model of the company based on data about one or more other companies;  
determining a market value contribution of each of the categories;  
modeling the effect of one or more operational decisions on the market value;  
enhancing the model based on the effect of such decisions on the other companies;  
making operating decisions based on the modeled effect;  
translating or mapping operational decisions' effect on the market value of the categories of assets; and

providing a visualization of that data.

10. A business information system for a business, comprising:
  - means for retrieving information concerning one or more tangible assets;
  - means for retrieving information concerning one or more intangible assets; and
  - means for deriving a business valuation estimate based on the information concerning one or more tangible assets and the information concerning one or more intangible assets.
11. The business information system of claim 10 further comprising means for retrieving market information concerning the business, wherein the means for deriving a business valuation estimate derives the business valuation estimate based on the market information, the information concerning the one or more tangible assets, and the information concerning the one or more intangible assets.
12. The business information system of claim 11 wherein the means for deriving a business valuation estimate includes:
  - means for deriving one or more asset weighting factors from the market information;
  - means for weighting the information concerning the one or more tangible assets according to one or more of the asset weighting factors; and
  - means for weighting the information concerning the one or more intangible assets according to one or more of the asset weighting factors, with the business valuation estimate based on the sum of the weighted tangible asset information and the weighted intangible asset information.
13. The business information system of claim 12:
  - wherein the information concerning tangible assets includes physical asset information and financial asset information and the information concerning intangible asset information includes customer asset information and employee asset information;
  - wherein the means for deriving one or more asset weighting factors from the market information derives at least four asset weighting factors;
  - wherein the means for weighting the information concerning the one or more tangible assets weights the physical asset information and the financial asset information according to two respective asset weighting factors; and
  - wherein the means for weighting the information concerning the one or more intangible

assets weights the customer asset information and the employee asset information according to two respective asset weighting factors, with the business valuation estimate based on the sum of the weighted physical asset information, the weighted financial asset information, the weighted customer asset information, and the weighted employee asset information.

14. A business information system for a business, comprising:
  - means for receiving information concerning one or more tangible business items;
  - means for receiving information concerning one or more intangible business items; and
  - means for deriving a business valuation estimate based on the information concerning the one or more tangible business items and the information concerning the one or more intangible business items.
15. The business information system of claim 14 wherein the information concerning one or more intangible assets includes information concerning employee or customer relationships.
16. The business information system of claim 15 wherein at least some of the received information is received from sources external to the system.
17. A business analysis method comprising:
  - capturing data concerning operation of a business;
  - dividing the data into physical-asset data, financial-asset data, employee-asset data, and customer-asset data; and
  - modeling market data as a function of the physical-asset data, the financial-asset data, the employee-asset data, and the customer-asset data to provide a visual indication of asset allocation.
18. A business analysis method comprising:
  - capturing data concerning operation of a first business and one or more comparable businesses;
  - dividing the data into physical-asset data, financial-asset data, employee-asset data, and customer-asset data for each business to define asset allocations for each business;
  - generating a visual display of the asset allocations for the businesses;
  - analyzing the effect of asset allocations for the businesses on overall market value of the businesses; and

making a business decision which affects the asset allocation between the physical-asset data, the financial-asset data, the employee-asset data, and the customer-asset data based on the analysis.

19. A business analysis method comprising:  
receiving or generating one or more business items; and  
weighting each of the one or more business items based on market data about one or more businesses.
20. The method of claim 19 further comprising:  
estimating an effect of one or more operational decisions on a market value of the business based on the weighting one or more of the business items.
21. The method of claim 19:  
wherein weighting each of the one or more business items includes modeling a market value of a business as a weighted sum of the one or more business items and computing a weight for each of the one or more business items based on the market value; and  
wherein the method further comprises changing one or more of the business items and deriving another market value of the business based on the weight for each of the one or more business items after changing the one or more business items.
22. The method of claim 19, wherein the one or more business items includes a physical business item, a financial business item, an employee business item, and a customer business item.
23. A business analysis method comprising:  
capturing two or more business items;  
modeling a given market value of a business as a weighted sum or linear combination of the two or more business items, including calculating one or more weights based on market data for one or more businesses, with each weight corresponding to one of the business items; and  
estimating a new market value of the business from the weights and the business items after changing the one or more business items.
24. The method of claim 23:

wherein the weighted sum of the two or more business items is a linear combination of the two or more business items; and  
wherein modeling the given market value of the business includes a regression analysis.

25. A business analysis method comprising:  
capturing a business asset allocation schedule including one or more business items; and  
determining a weight for each of the one or more business items based on market data for one or more businesses.
26. A method of estimating a value of a business, comprising:  
capturing a business asset allocation schedule including one or more business items; and  
estimating the value of the business from the one or more business items and market data for one or more businesses.
27. The method of claim 26 wherein market data comprises data related to the exchange of equity or debt instruments for the one or more businesses.
28. The method of claim 26 wherein estimating the value of the business based on the one or more business items and on market data for one or more businesses comprises:  
weighting each of the one or more business items based on the market data for one or more businesses; and  
estimating the value of the business based on each of the two or more weighted business items.
29. The method of claim 28 wherein weighting each of the one or more business items includes deriving one or more corresponding regression coefficients based on the market data and scaling each of the one or more business items based on its corresponding regression coefficient.
30. A business analysis method comprising:  
capturing data concerning a business;  
distributing a first portion of the data to a physical-asset module, a second portion of the data to a financial-asset module, a third portion of the data to an employee-asset module, a fourth portion of the data to a customer-asset module;  
providing market data to the physical-asset module, the financial-asset module, the employee-asset module, and the customer-asset module; and

calculating a respective market contribution coefficient in each module, with each coefficient estimating a proportionate effect of each portion of data on the market data.

31. A method of estimating a value of a business, comprising:  
capturing a business asset allocation schedule including two or more asset-value indicators from two or more corresponding asset categories;  
weighting each of the two or more asset-value indicators based on market data for one or more businesses; and  
estimating the value of the business based on each of the two or more weighted asset-value indicators.
32. The method of claim 31 wherein the business asset allocation schedule includes a category of tangible assets and a category of intangible assets.
33. The method of claim 31 wherein weighting each of the two or more asset-value indicators based on market data for one or more businesses includes weighting the asset-value indicators based on market data for the business, for a group of businesses in a common industry, for a group of business in a common economic sector, or for a group of businesses having one or more common traits.
34. The method of claim 31, wherein:  
the business asset allocation schedule includes at least four asset categories and at least four corresponding asset-value indicators;  
weighting each of the two or more asset-value indicators includes weighting each of the four asset-value indicators; and  
estimating the value of the business includes adding the four weighted asset-value indicators.
35. The method of claim 31, wherein the business asset allocation schedule includes a physical-asset category and a corresponding physical-asset-value indicator, a financial-asset category and a corresponding financial-asset-value indicator, a customer-asset category and a corresponding customer-asset-value indicator, and an employee-asset category and a corresponding employee-asset category.
36. The method of claim 31 wherein weighting each of the two or more asset-value



indicators includes deriving two or more corresponding regression coefficients based on the market data and scaling each of the two or more asset-value indicators based on its corresponding regression coefficient.

37. The method of claim 31 wherein receiving or generating a business asset allocation schedule comprises receiving information through a wired or wireless communications network from one or more public or proprietary databases and wherein weighting each of the two or more asset-value indicators includes receiving information through a wired or wireless communications network from one or more public or proprietary databases including market data for the one or more businesses.

38. A method of estimating a value of a business, comprising:  
capturing a business asset allocation schedule including a physical-asset-value indicator, a financial-asset-value indicator, a customer-asset-value indicator, and an employee-asset-value indicator;  
weighting the physical-asset-value indicator, the financial-asset-value indicator, the customer-asset-value indicator, and the employee-asset-value indicator based on market data for one or more businesses; and  
estimating the value of the business based on the weighted physical-asset-value indicators, the weighted financial-asset-value indicator, the weighted customer-asset-value indicator, and the weighted employee-asset-value indicator.

39. The method of claim 38 wherein weighting each asset-value indicator based on market data for one or more businesses includes weighting each asset-value indicator based on market data for the business or for two or more businesses having one or more common traits.

40. The method of claim 38 wherein weighting each of the two or more asset-value indicators includes deriving two or more corresponding regression coefficients based on the market data and scaling each of the two or more asset-value indicators based on its corresponding regression coefficient.

41. The method of claim 40 wherein receiving or generating a business asset allocation schedule comprises receiving information through a wired or wireless communications network from one or more public or proprietary databases and wherein weighting each of the two or more asset-value indicators includes receiving information through a wired or wireless communications network from one or more public or proprietary databases including market data

for the one or more businesses.

42. A method of estimating a value of a business, comprising:  
receiving business information about the business;  
deriving or extracting from the business information a business asset allocation schedule including a physical business item, a financial-business item, a customer business item, and an employee business item;  
receiving market information for one or more businesses having at least one trait in common with the business through a wired or wireless communications network from one or more public or proprietary databases;  
weighting the physical business item, the financial business item, the customer business item, and the employee business item based on the market information, wherein weighting includes deriving a corresponding regression coefficient based on the market information for each business item and scaling each business item based on its corresponding regression coefficient; and  
estimating the value of the business based on the weighted physical business item, the weighted financial business item, the weighted customer business item, and the weighted employee business item.
43. A method of analyzing hypothetical operating decisions for a business, comprising:  
modeling a market value indicator of the business as a mathematical function of two or more business items;  
modeling or representing a business operating decision as a change in one or more of the business items; and  
evaluating the mathematical function based on the change in the one or more of the business items to determine a relative change in the market value indicator or to determine a projected market value indicator.
44. The method of claim 43 wherein modeling a market value indicator of the business comprises performing a regression analysis of the market value indicator and the two or more business items.
45. A method of estimating a market value of a business, the method comprising:  
receiving information concerning tangible assets and intangible assets;  
calculating one or more asset weighting factors based on information concerning past or current market value of the business;

weighting the information concerning the tangible assets and intangible assets based on the one or more asset weighting factors; and  
combining the weighted information concerning the tangible and intangible assets.

46. A method of estimating a market value of a business, the method comprising:  
receiving information concerning tangible assets and information concerning intangible assets;  
weighting the information concerning the tangible assets and the information concerning intangible assets based on one or more market-based weighting factors;  
summing the weighted information concerning the tangible assets and the information concerning the intangible assets to provide an indication of market value for the business.
47. A method of estimating a market value of a business, the method comprising:  
receiving asset allocation information identifying two or more asset allocation amounts;  
weighting one or more of the asset allocation amounts based on one or more market-based weighting factors; and  
summing the asset allocation amounts after weighting one or more of the asset allocation amounts to provide an indication of the market value.
48. A method of analyzing hypothetical asset allocation strategies, the method comprising:  
capturing data concerning two or more asset allocation categories;  
weighting the data using one or more market-based asset weighting factors;  
displaying an indicator of market response on a display.
49. A method comprising:  
identifying two or more business components that affect value of a business  
aggregating the identified assets into two or more categories;  
retrieving or determining a market value of the business;  
weighting the assets based on the market value of the business; and  
modeling the market value as a sum of the weighted assets in the two or more categories.
50. A computer readable medium having instructions stored thereon for causing a computer to implement one or more methods described in claims 17 through 49.
51. A method of modeling asset investment allocations in an operating business concern,

the method comprising:

defining tangible and intangible assets as having a value;  
modeling the effect of business operational decisions on the value of the assets; and  
providing a visual indication of such effect on the value of the assets.

52. A method of analyzing hypothetical asset allocations of a business, comprising:  
classifying assets of the business into two or more categories;  
determining a market-value regression model including an asset-value indicator for  
each of the two or more asset categories and a regression coefficient for each  
asset-value indicator, with each regression coefficient based on market data  
for one or more businesses;  
changing one or more of the asset-value indicators; and  
outputting a market value based on the market value regression model after changing  
one or more of the asset-value indicators.
53. A data processing system for managing a business comprising:  
organizing tangible and intangible assets into multiple categories of assets;  
determining a market value contribution of each of the categories; and  
displaying the effect.
54. A system comprising:  
means for representing or determining values of assets in a business;  
means for combining the values of the assets based on a market value for the  
business; and  
means for providing a visual indication of the combination of values.
55. A method of managing a target business based on business information about a one  
or more other businesses, the method comprising:  
generating or receiving business information for the target business;  
generating or receiving business information for the one or more other businesses;  
classifying the business information for the target business into two or more asset  
categories;  
classifying the business information for the one or more businesses into the two or  
more asset categories;  
modeling a market value associated with the target business as a function of the  
assets in the two or more asset categories;

modeling a market value associated with the one or more other businesses as a function of the assets in the two or more asset categories; and comparing one or more portions of the function for the market value associated with the target business to one or more portions of the function for the market value associated with the one or more other businesses.

56. A method comprising deriving meaningful information about a company by analyzing standard market data associated with the company or standard market data associated with one or more other companies.

57. A method comprising deriving data indicative or representative of the relative contribution of one or more assets of a business to a market value of the business, based on business information about one or more other companies.

58. A financial measurement and reporting system comprising:  
means for collecting business items for a business;  
means for classifying the business items into at least physical, financial, employee and customer categories;  
means for determining a relative contribution of one or more of the business items in each of the physical, financial, employee, and customer categories to a market value of the business;  
means for reporting the business items classified into the physical, financial, employee and customer categories and the relative contribution of the one or more of the business items in each of the physical, financial, employee, and customer categories.

59. A financial measurement and reporting system comprising:  
means for identifying one or more business items for a business;  
means for determining a relative contribution of each of the one or more business items to a market value of the business; and  
means for reporting the relative contribution of the one or more of the business items to the market value of the business.

60. The system of claim 59 wherein the means for reporting comprises a paper document or an electronic display.

61. A computer-implemented method comprising:  
receiving or generating two or more business items;  
modeling a given market value of a business as a weighted sum or linear combination) of the two or more business items, including calculating one or more weights based on market data for one or more businesses, with each weight corresponding to one of the business items; and  
estimating a new market value of the business from the weights and the business items after changing the one or more business items.
62. The method of claim 61:  
wherein the weighted sum of the two or more business items is a linear combination of the two or more business items; and  
wherein modeling the given market value of the business includes a regression analysis.
63. A method of estimating a value of a business, comprising:  
receiving or generating two or more business items for the business;  
weighting each of the two or more business items based on two or more corresponding market-based weights; and  
determining a sum of the two or more weighted business items.
64. A method of depicting a market value of a business, comprising:  
receiving data regarding the market value of the business;  
receiving data regarding the business, the data including a first portion concerning one or more physical assets of the business, a second portion concerning one or more financial assets of the business, a third portion concerning one or more employee assets of the business, and a fourth portion concerning one or more customer assets of the business;  
determining first, second, third, and fourth relative contributions to the market value based respectively on at least the first, second, third, and fourth portions of the data; and  
displaying a graphic aid having a total area and including first, second, third, and fourth respective regions, with each respective region having a respective area based on a ratio of a respective one of the total relative contributions to the market value.

65. A method of depicting a market value of a business, comprising:  
receiving data regarding the market value of the business;  
receiving data regarding the business, the data including a first portion concerning one or more physical assets of the business, a second portion concerning one or more financial assets of the business, a third portion concerning one or more employee assets of the business, a fourth portion concerning one or more customer assets of the business, and a fifth portion concerning one or more organizational assets for the business;  
determining first, second, third, fourth, and fifth relative contributions to the market value based respectively on at least the first, second, third, fourth, and fifth portions of the data; and  
displaying a graphic aid having a total area and including first, second, third, fourth, and fifth respective regions, with each respective region having a respective area based on a ratio of a respective one of the total relative contributions to the market value.
66. The method of claim 66, wherein the graphic aid has a rectangular periphery.
67. The method of claim 66, wherein the graphic aid has a rectangular periphery, wherein each of the first, second, third, and fourth regions are five-sided polygons, and wherein the fifth region is a four-sided polygon.
68. The method of claim 66, wherein the graphic aid has a rectangular periphery, and wherein each of the first, second, third, fourth, and fifth regions includes at least four sides.
69. A method of depicting a market value, comprising:  
decomposing the market value into at least five components; and  
rendering an image having a first bounded area representative of the market value, with the first bounded area comprising at least five identifiable regions, with each of the five regions having an area based on the proportionate contribution of a respective one of the five components to the market value.
69. A method of depicting a market value, comprising:  
decomposing the market value into at least three components; and  
rendering an image having a first bounded area representative of the market value, with the first bounded area comprising at least three identifiable regions, with

each of the three regions having an area based on the proportionate contribution of a respective one of the three components to the market value.

70. A graphic aid for depicting a market value, comprising:  
a first region representative of an actual or estimated proportionate contribution of employee assets to the market value; and  
a second region representative of an actual or estimated pro rata contribution of customer assets to the market value.
71. The graphic aid of claim 70, wherein one of the first and second regions represents a negative contribution to the market value.
72. A graphic aid for depicting a market value, comprising:  
a first region representative of an actual or estimated contribution of physical or financial assets to the market value;  
a second region representative of an actual or estimated proportionate contribution of employee assets to the market value; and  
a third region representative of an actual or estimated pro rata contribution of customer assets to the market vlaue.
73. The graphic aid of claim 70, wherein one of the first and second regions represents a negative contribution to the market value.
74. The graphic aid of claim 70 further comprising: means for indicating that at least one of the customer assets, the employee assets has made no appreciable contribution to the market value.
75. A computerized business consulting system, comprising:  
means for receiving or processing market data;  
means for receiving business data and one or more consulting requests from a first business;  
means for receiving business data and one or more consulting requests from a second business;  
means for organizing the business data from the first or the second business into two or more asset categories; and  
means for determining an answer to the one or more of the first consulting requests or



second consulting request, with the answer based on the market data and the organization of the business data into the two or more asset categories.

76. The system of claim 75, wherein the means for receiving business data and one or more consulting requests from the second business can receive concurrent with the means for receiving business data from the first business

77. The system of claim 74 wherein one or more of the consulting requests from the first business includes a request for a projection of a market response to a operational decision.

78. The system of claim 77, wherein the means for organizing the business data organizes the data into three or more categories and wherein the means for determining an answer includes:

means for modeling the market data as a function of at least a portion of the business data in each of the three or more categories; and

means for determining or estimating effects of the operational decision on at least the portion the business data in each of the categories; and

means for evaluating the function based on the determined or estimated effects to determine an estimate or projection of new market data.

79. The system of claim 78 wherein the market data is a market value of the first business, and the system further comprises means for communicating the estimate or projection of new market data to the first business.

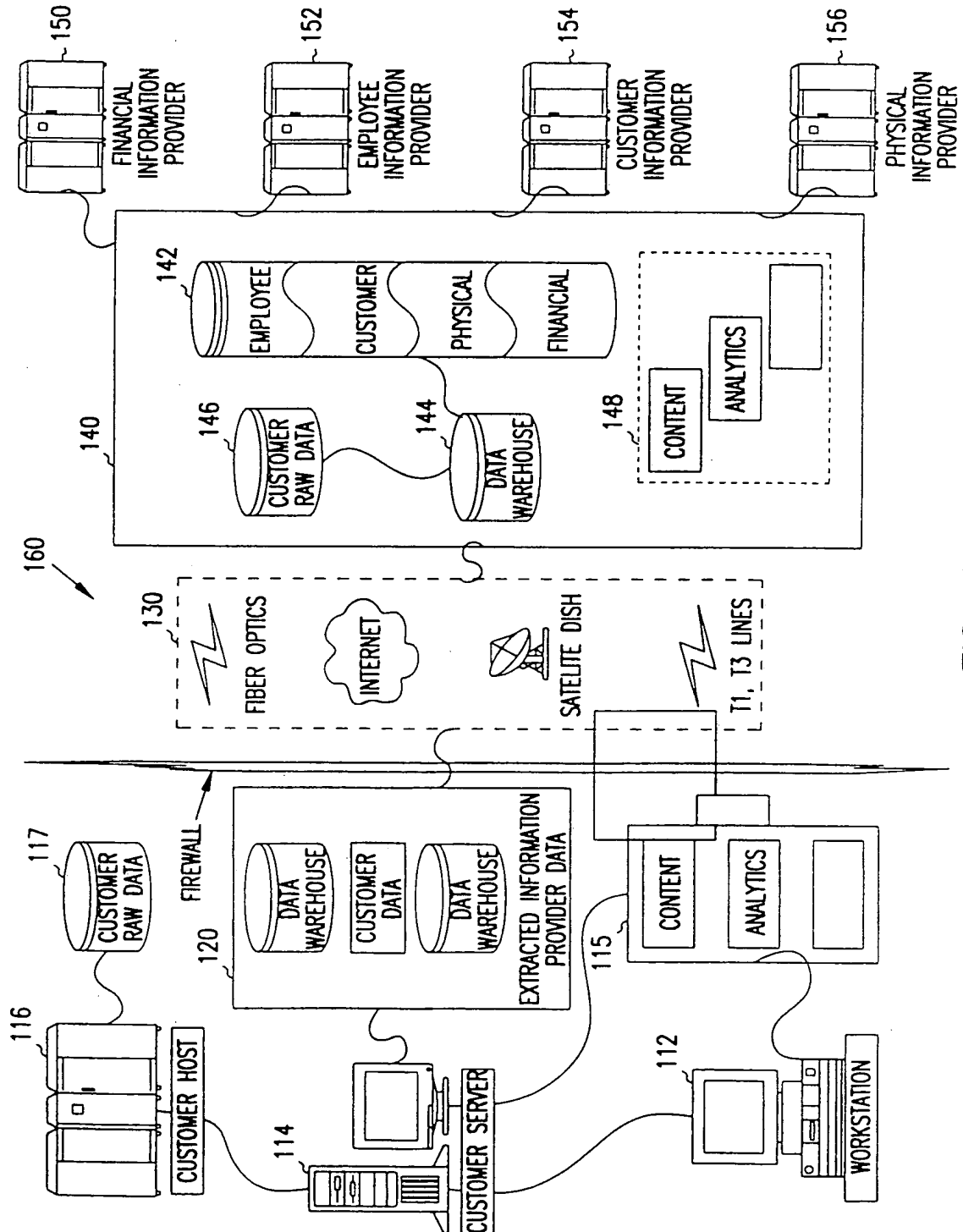


FIG. 1

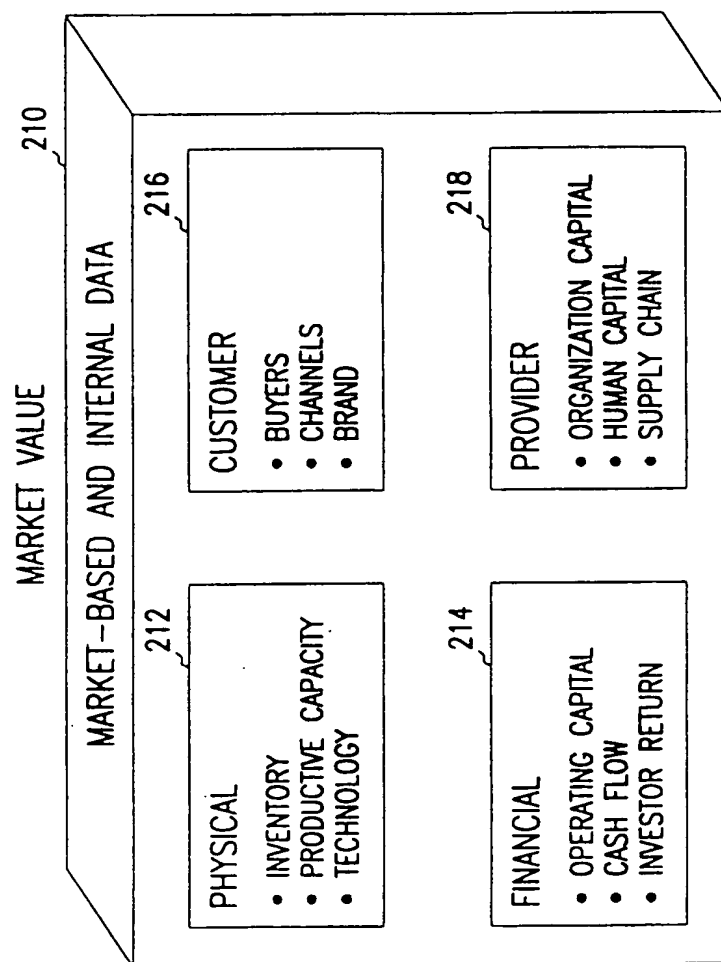


FIG. 2A

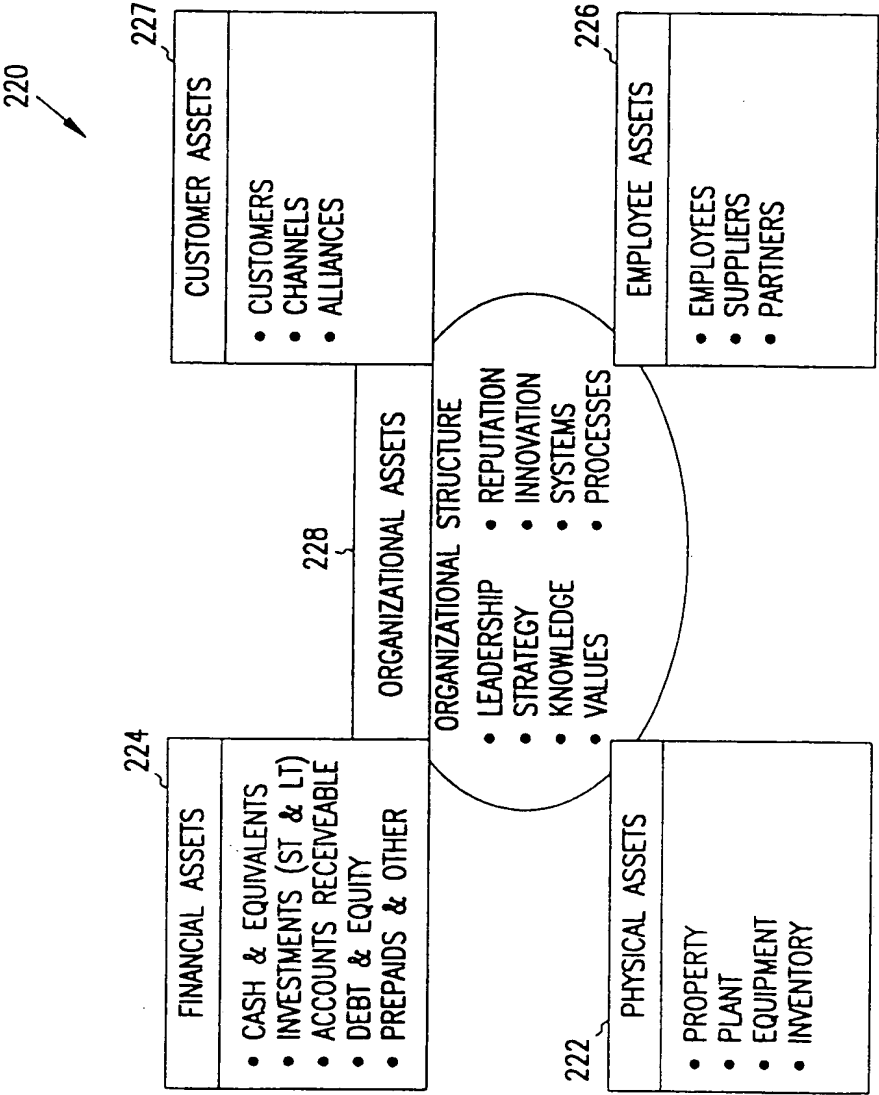


FIG. 2B

310

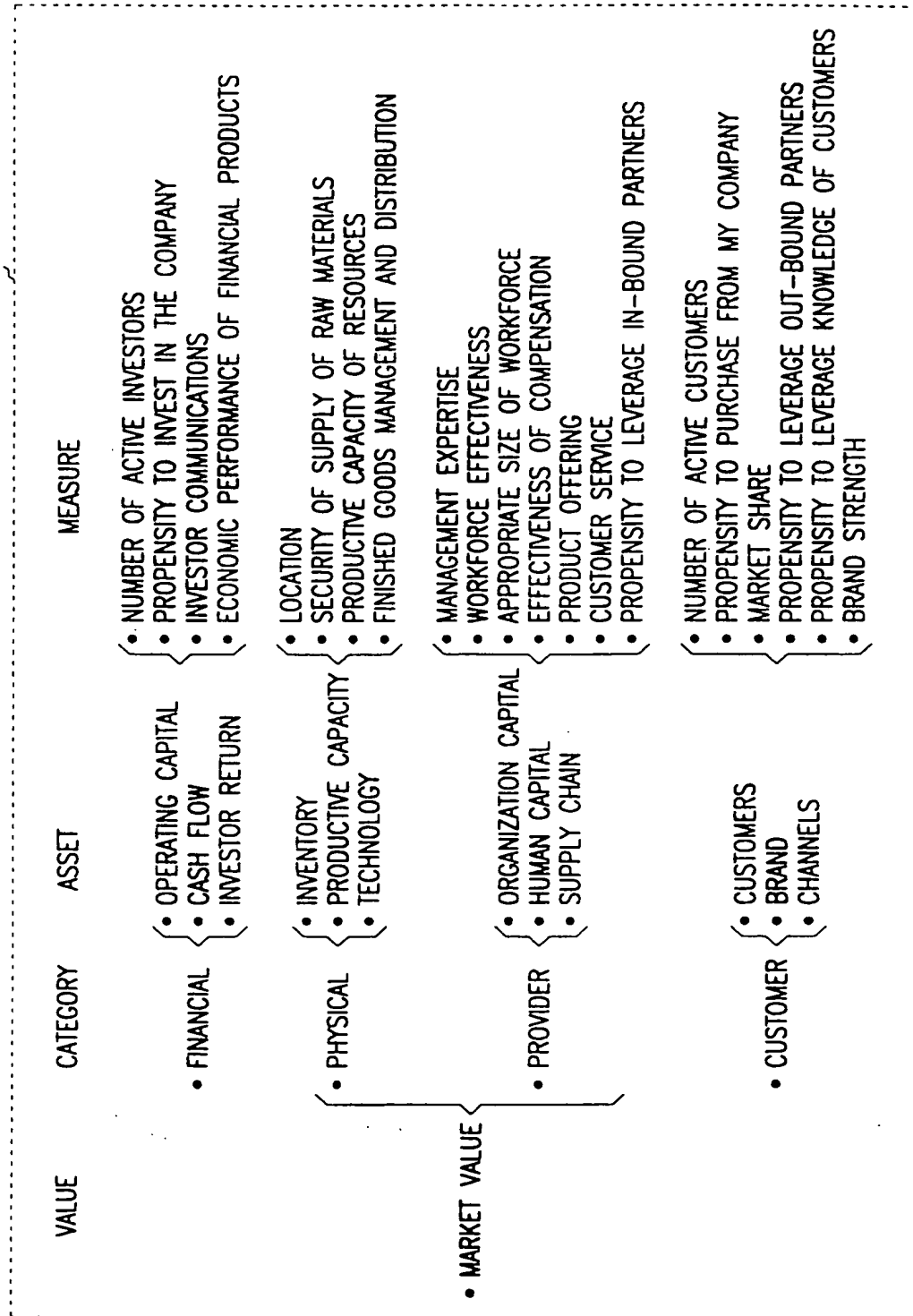


FIG. 3

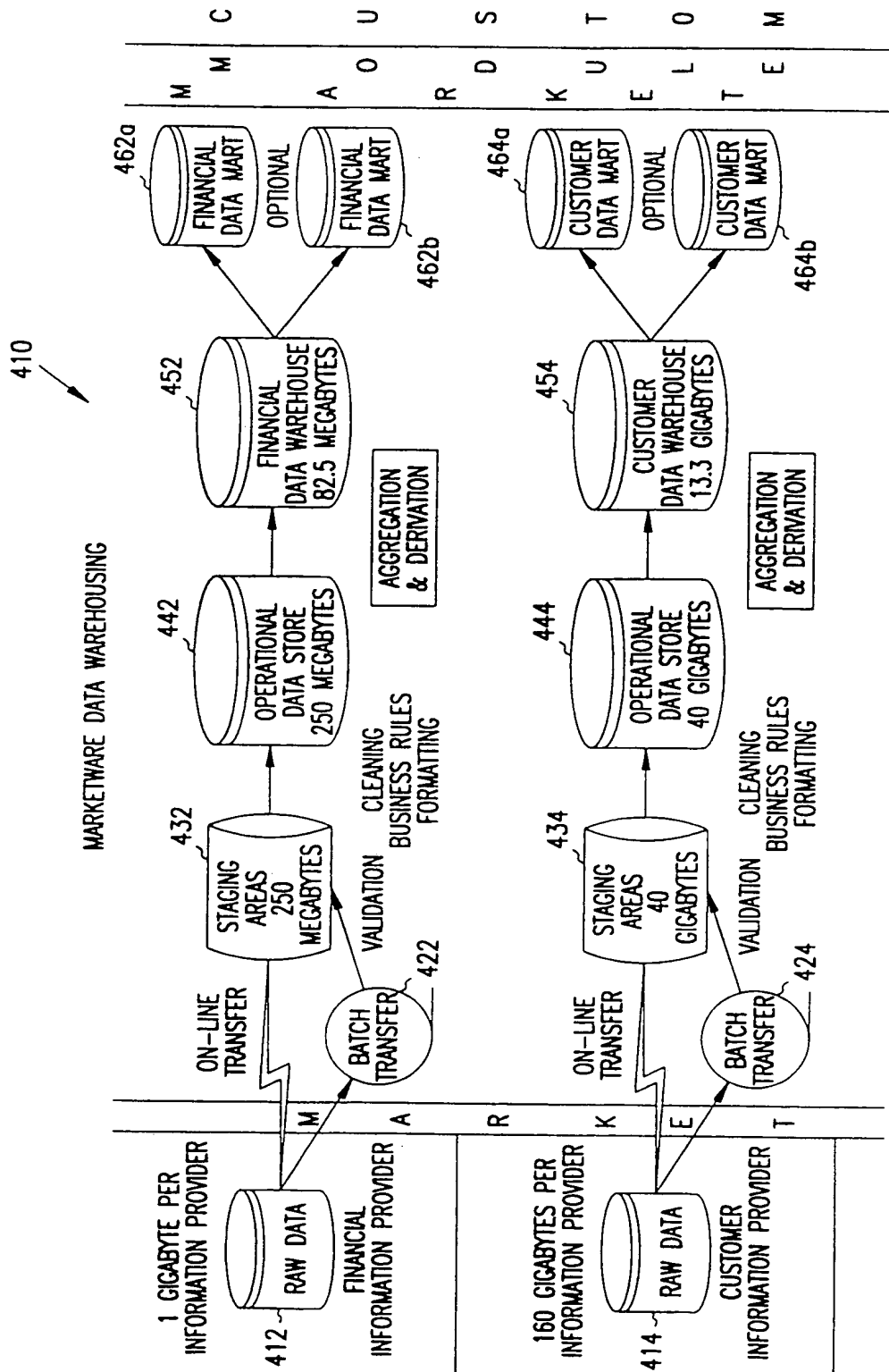


FIG. 4A

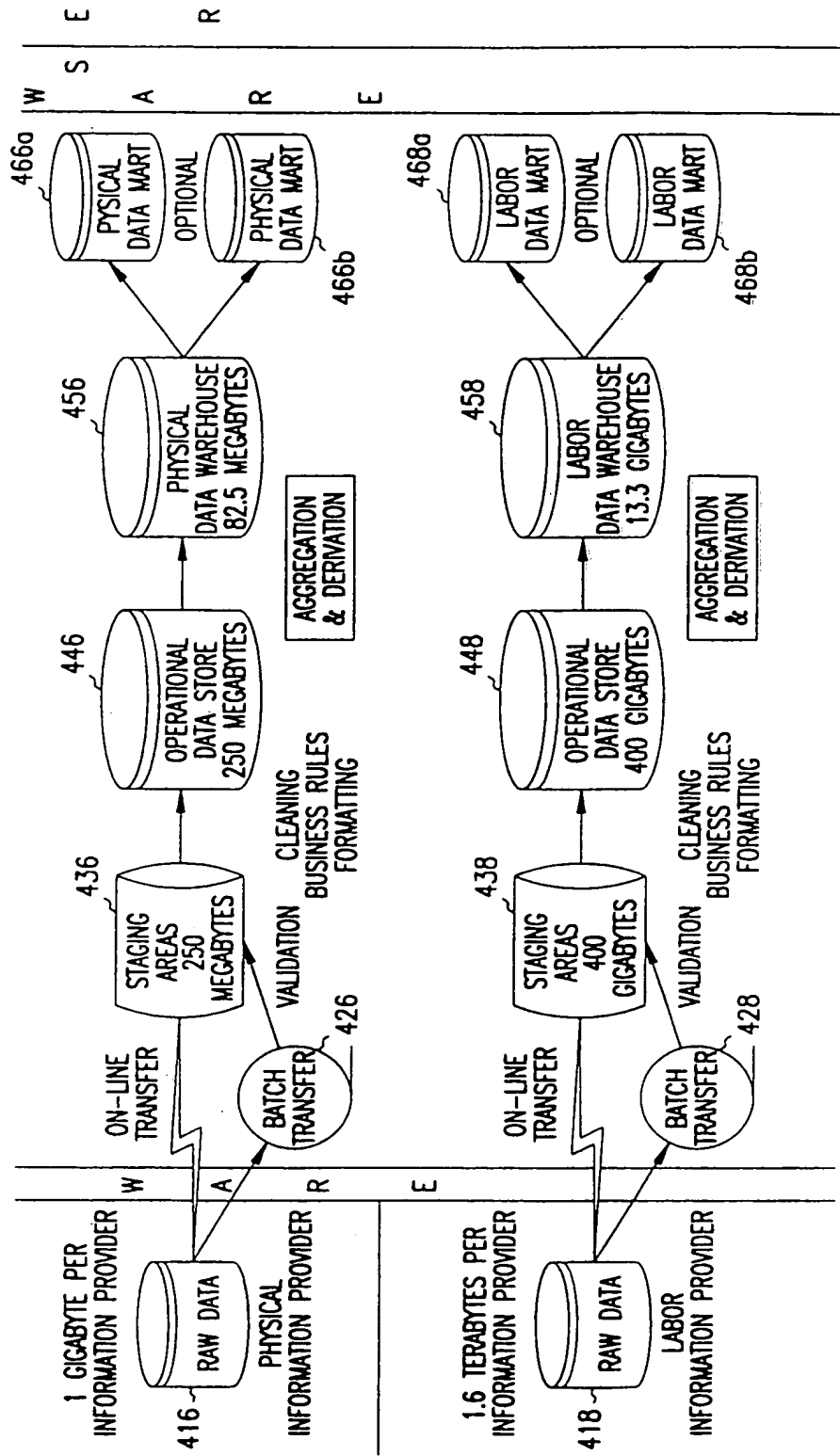


FIG. 4B

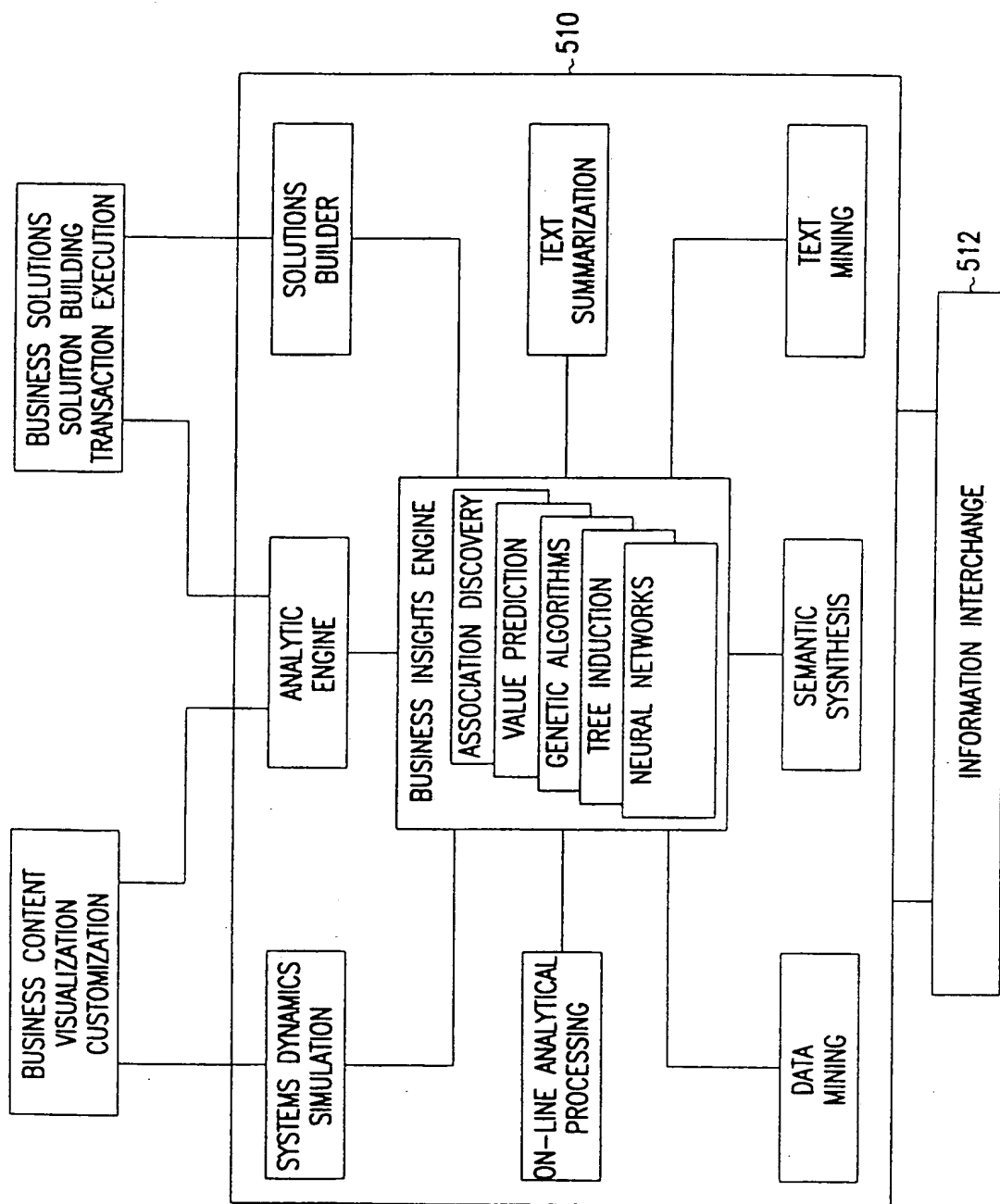


FIG. 5



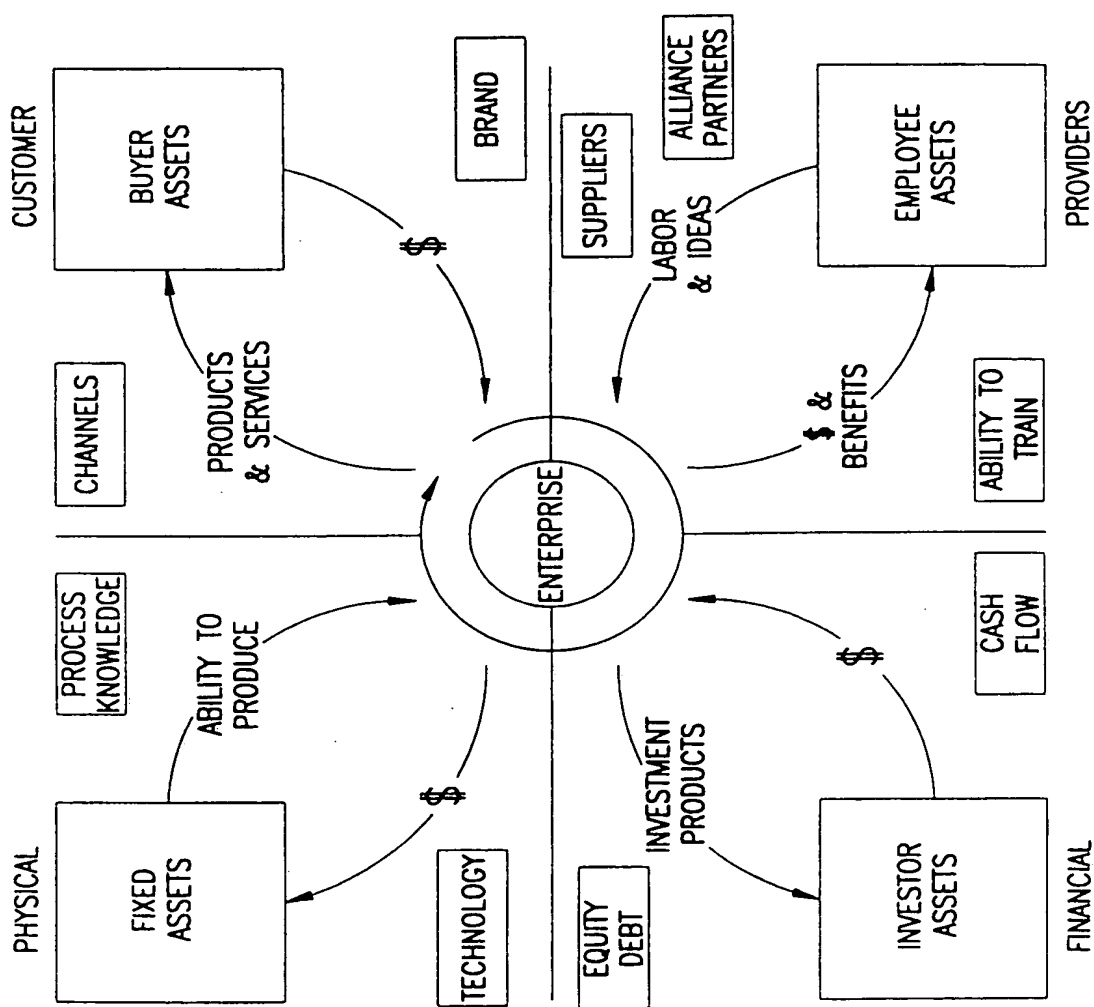
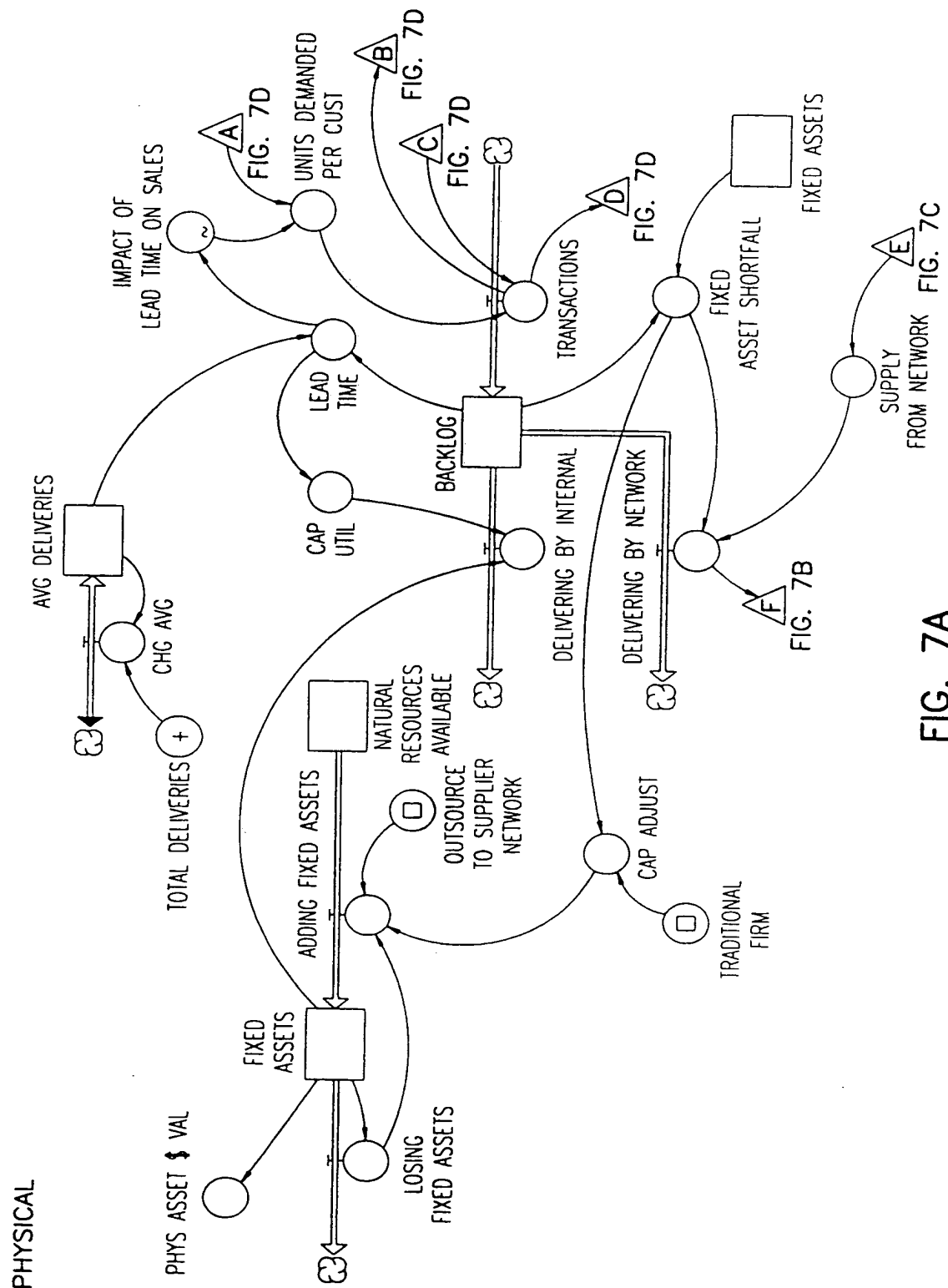
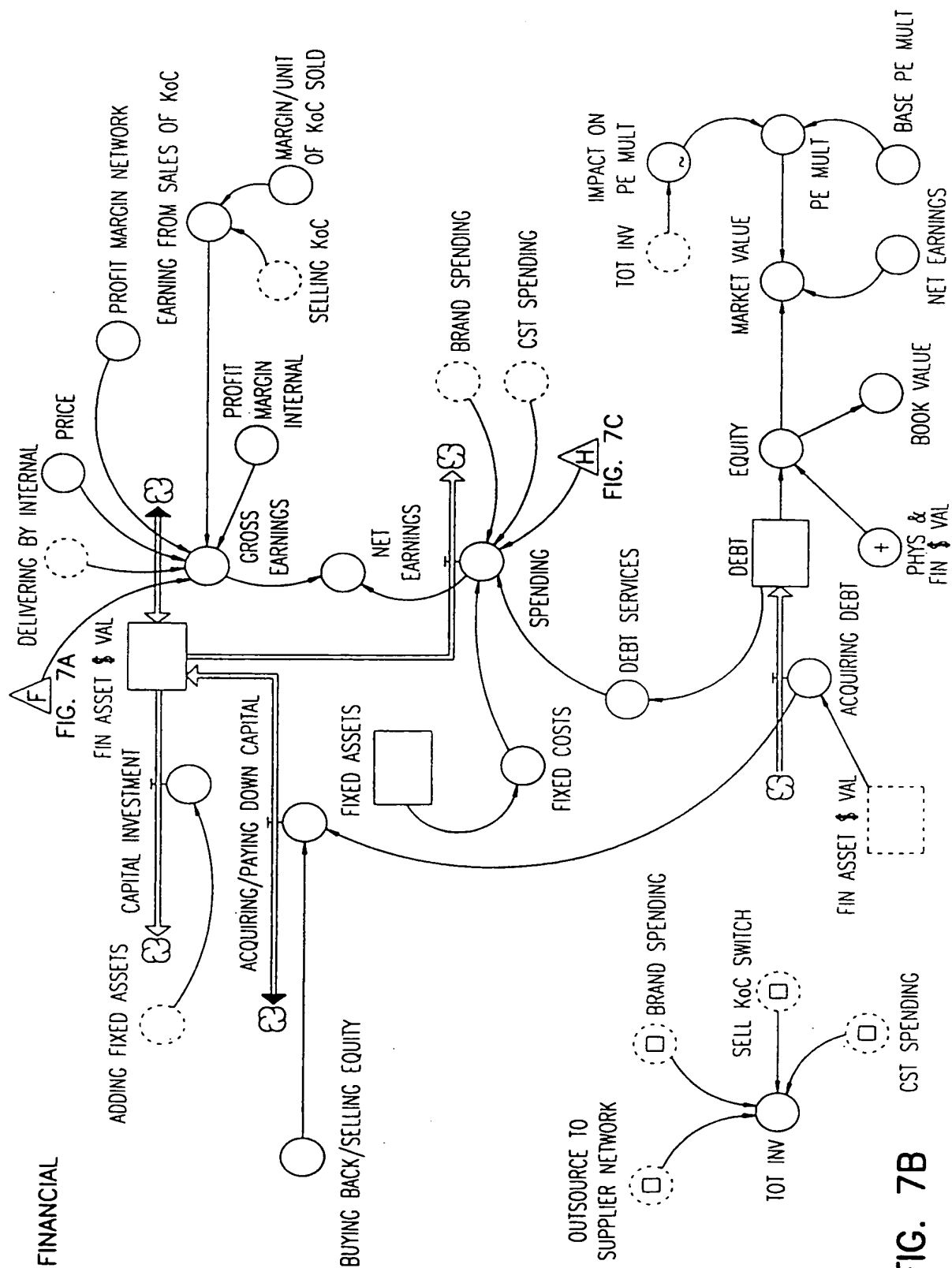


FIG. 6





EMPLOYEE

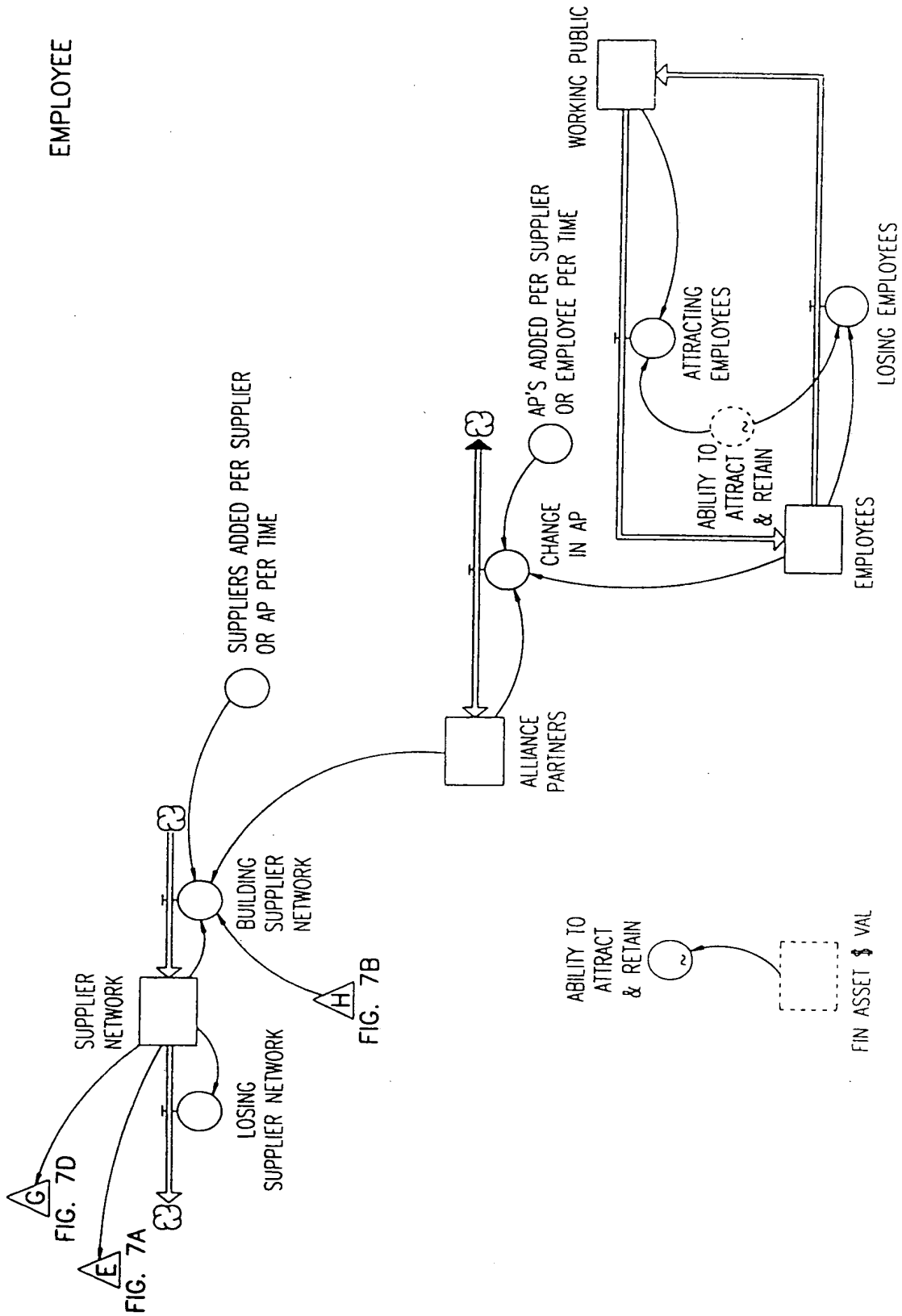


FIG. 7C

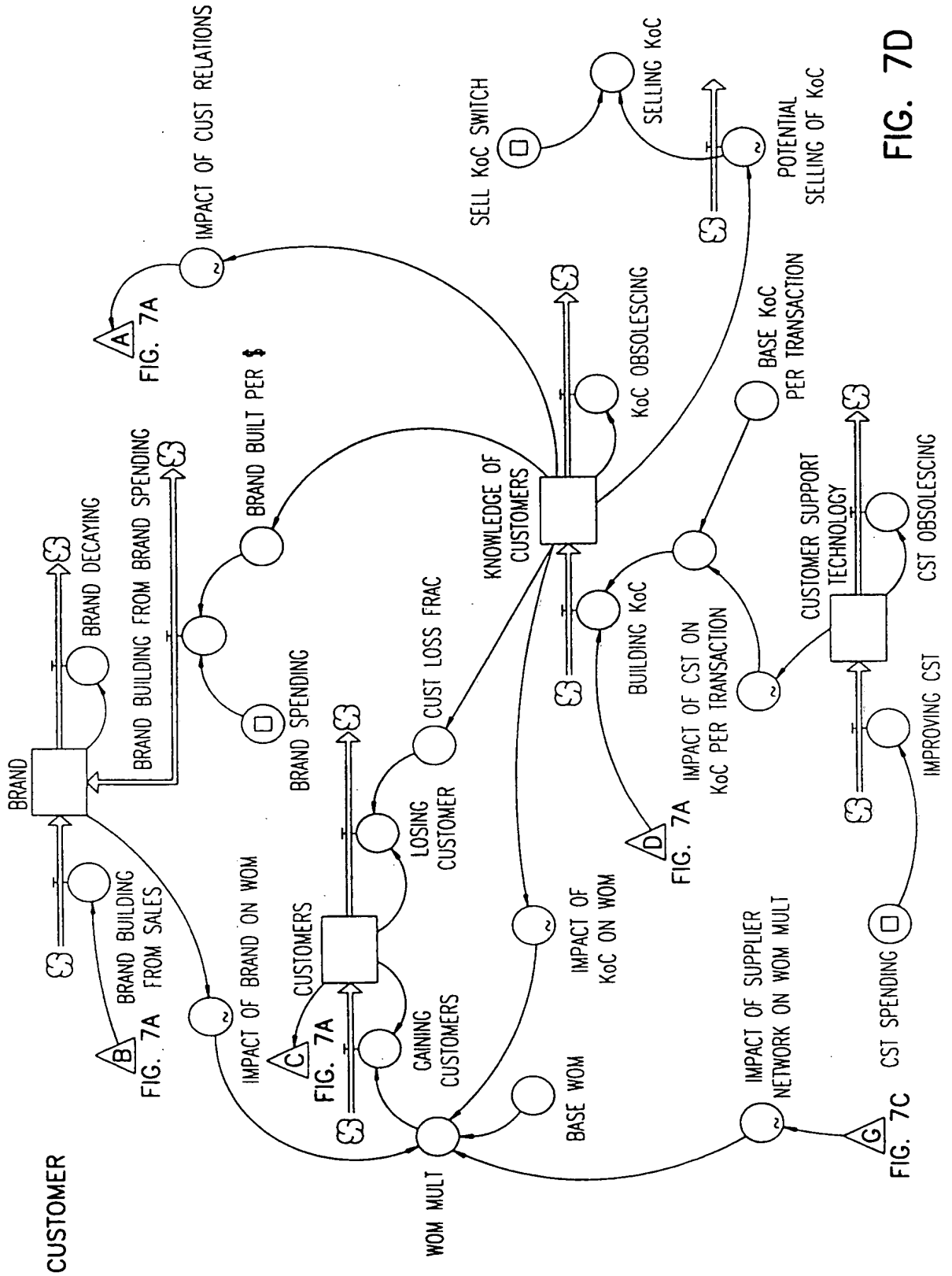


FIG. 7D

**EXEMPLARY STOCK EQUATIONS**

$$\text{Alliance\_Partners}(t) = \text{Alliance\_Partners}(t - dt) + (\text{change\_in\_AP}) * dt$$

$$\text{Avg\_Deliveries}(t) = \text{Avg\_Deliveries}(t - dt) + (\text{chg\_avg}) * dt$$

$$\text{Backlog}(t) = \text{Backlog}(t - dt) + (\text{transactions} - \text{delivering\_by\_network} - \text{delivering\_by\_internal}) * dt$$

$$\text{Brand}(t) = \text{Brand}(t - dt) + (\text{Brand\_building\_from\_sales} + \text{Brand\_building\_from\_brand\_spending} - \text{Brand\_decaying}) * dt$$

$$\text{Customers}(t) = \text{Customers}(t - dt) + (\text{gaining\_Customers} - \text{losing\_Customers}) * dt$$

$$\text{Customer\_Support\_Technology}(t) = \text{Customer\_Support\_Technology}(t - dt) + (\text{improving\_CST} - \text{CST\_obsolescing}) * dt$$

$$\text{Debt}(t) = \text{Debt}(t - dt) + (\text{acquiring\_debt}) * dt$$

$$\text{Employees}(t) = \text{Employees}(t - dt) + (\text{attracting\_Employees} - \text{losing\_Employees}) * dt$$

$$\text{Fin\_Asset\_}\$ \_ \text{Val}(t) = \text{Fin\_Asset\_}\$ \_ \text{Val}(t - dt) + (\text{gross\_earnings} + \text{acquiring\_paying\_down\_capital} - \text{capital\_investment} - \text{spending}) * dt$$

$$\text{Fixed\_Assets}(t) = \text{Fixed\_Assets}(t - dt) + (\text{adding\_Fixed\_Assets} - \text{losing\_Fixed\_Assets}) * dt$$

$$\text{Knowledge\_of\_Customers}(t) = \text{Knowledge\_of\_Customers}(t - dt) + (\text{building\_KoC} - \text{KoC\_obsolescing}) * dt$$

$$\text{Natural\_Resources\_Available}(t) = \text{Natural\_Resources\_Available}(t - dt) + (-\text{adding\_Fixed\_Assets}) * dt$$

$$\text{Supplier\_Network}(t) = \text{Supplier\_Network}(t - dt) + (\text{building\_supplier\_network} - \text{losing\_supplier\_network}) * dt$$

$$\text{Working\_Public}(t) = \text{Working\_Public}(t - dt) + (\text{losing\_Employees} - \text{attracting\_Employees}) * dt$$

**EXEMPLARY USER INPUTS:**

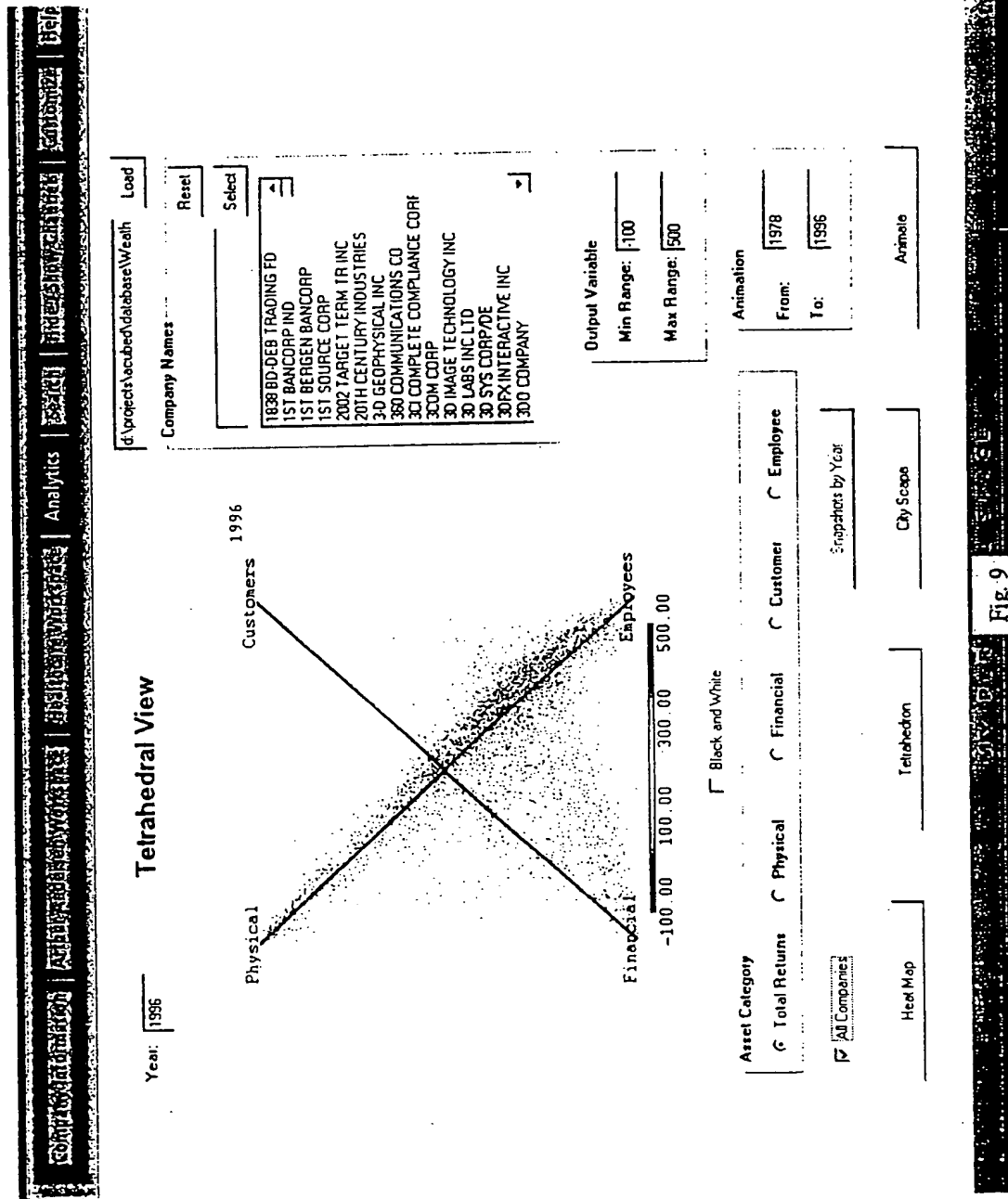
Brand\_spending

CST\_spending

Outsource\_to\_Supplier\_Network

sell\_KoC\_switch

Traditional\_Firm Switch



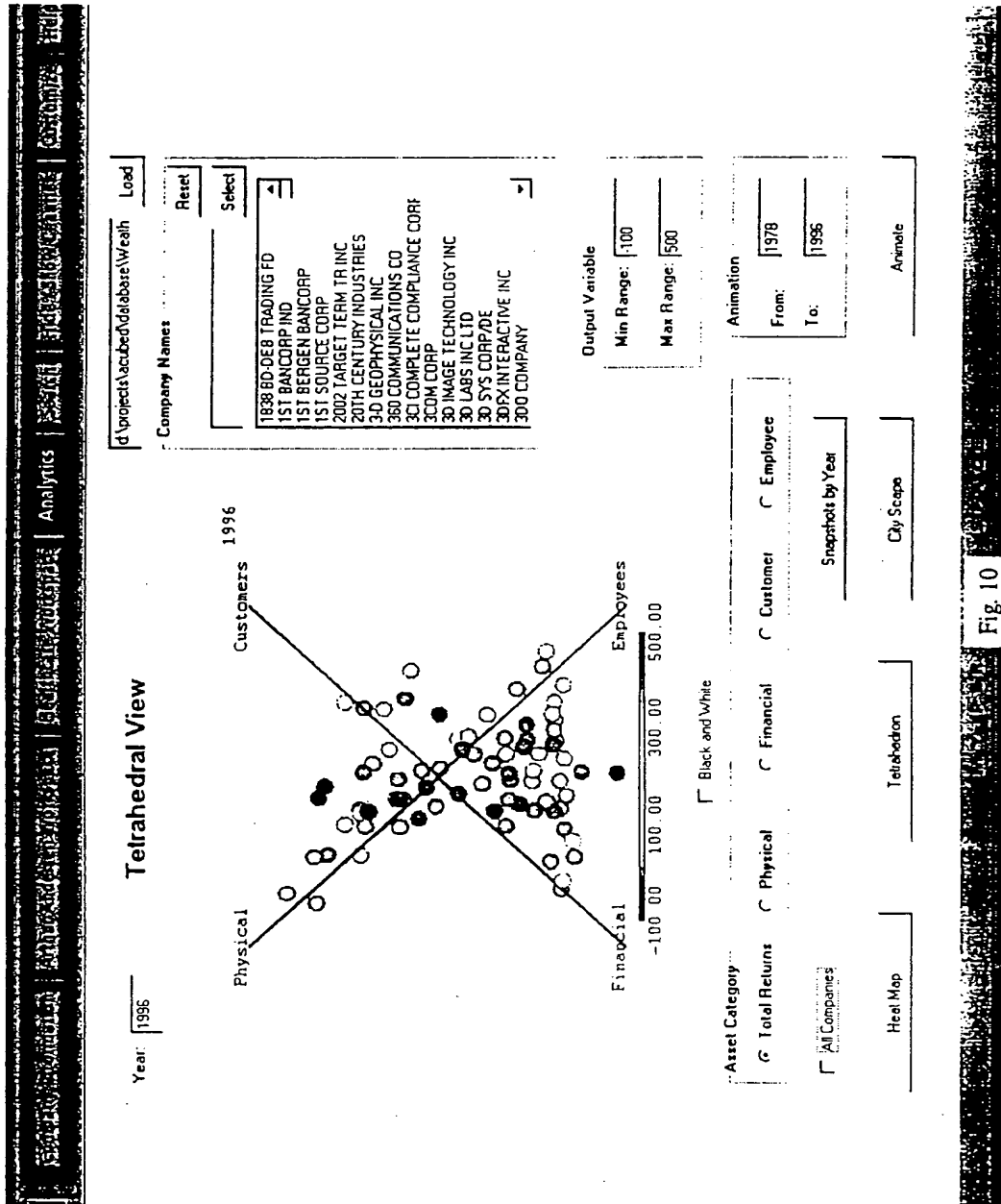
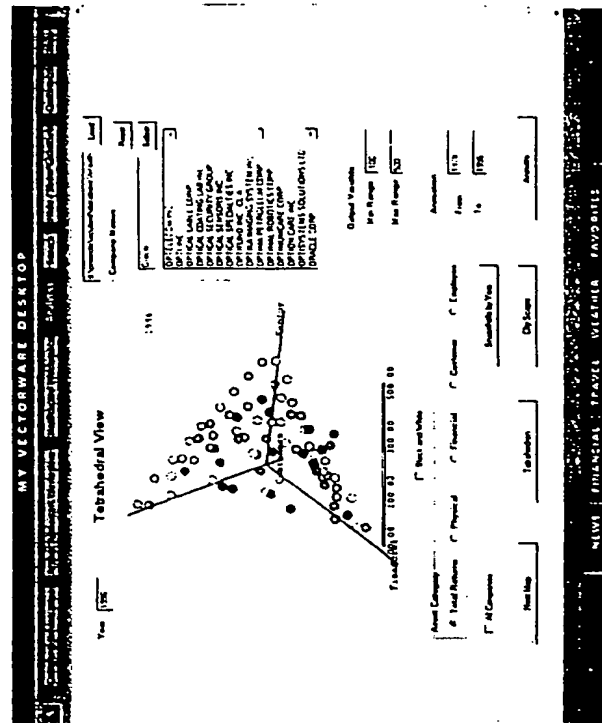
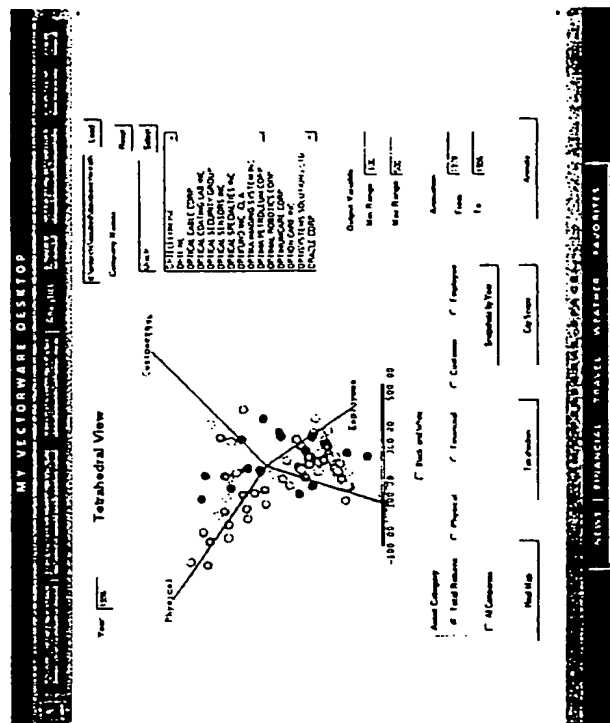
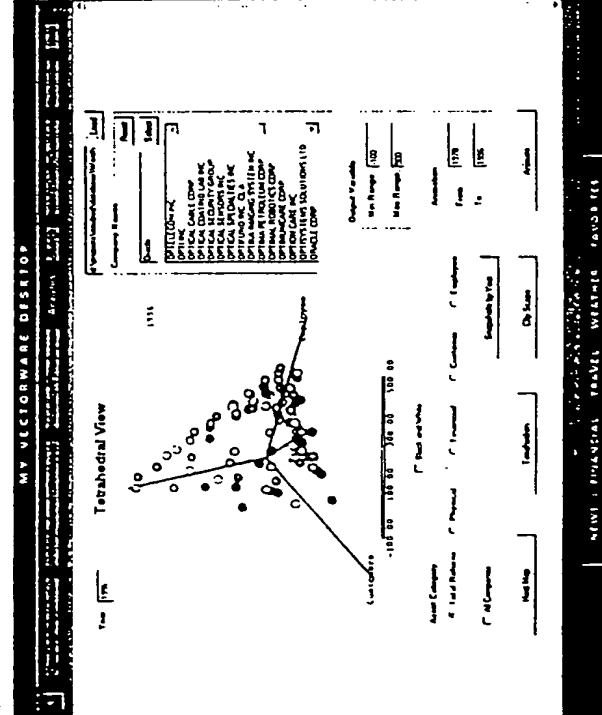
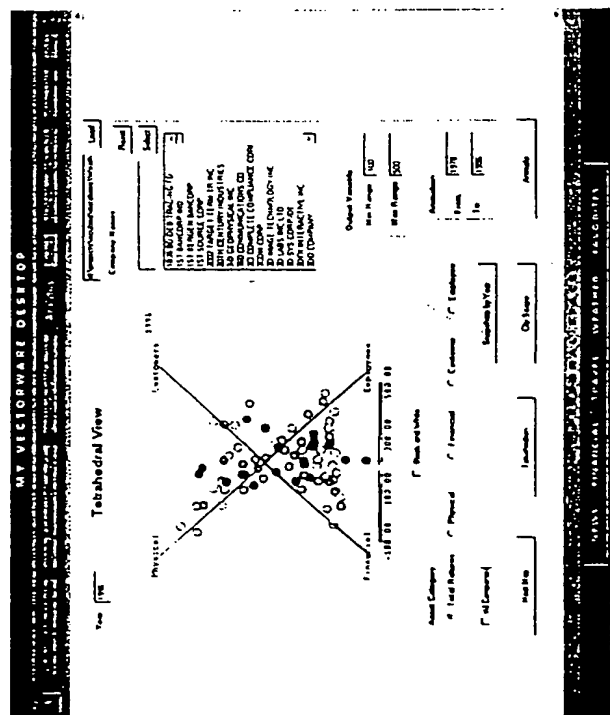


Fig. 10





**Fig. 11**



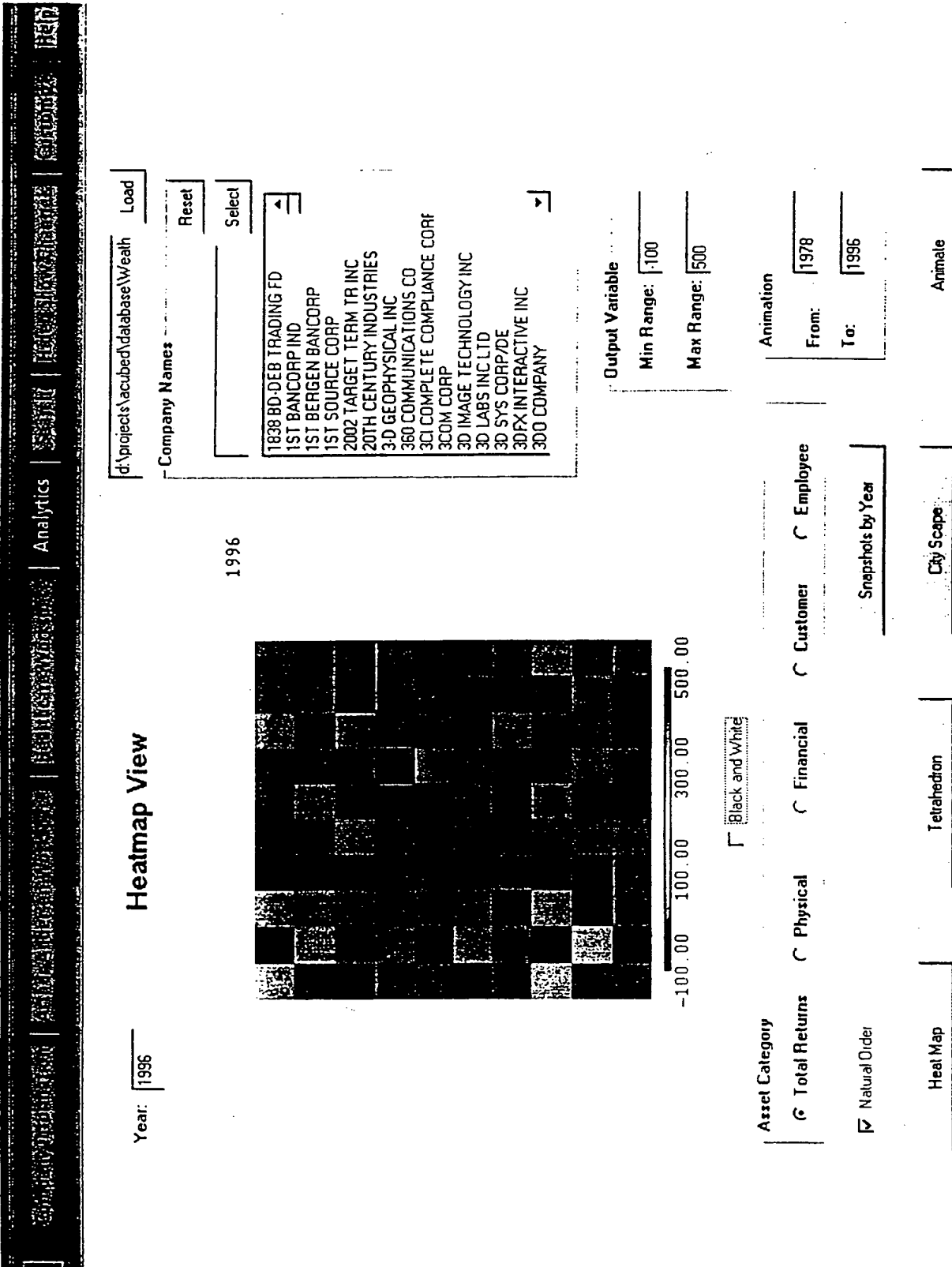


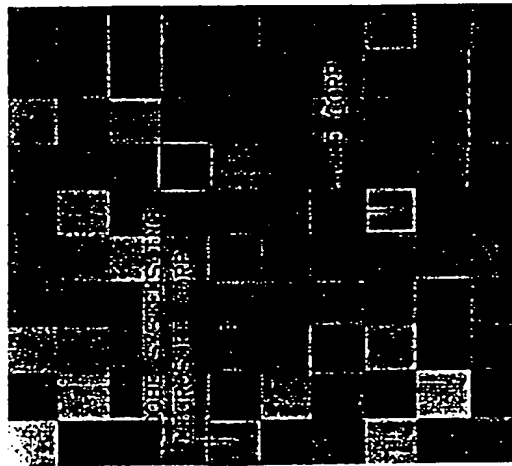
Fig. 12

# MY VECTORWARE DESKTOP

Company Information | Map | Data | Analysis | Settings | Help

## HeatMap View

Year: 1996



-100.00 100.00 300.00 500.00

Black and White

Asset Category

☒ Total Returns ☐ Physical ☐ Financial ☐ Customer

☒ Natural Order

Heat Map

Tetrahedon

Fig. 13

d:\projects\acubed\database\Wealth Load

Company Names Reset

Cluster #26

ORACLE CORP

Companies in Cluster 26

- DELPHI INFORMATION SYSTEMS
- DIALOG CORP PLC - SPON ADR
- DYNATEM INC
- ECI TELECOMMUNICATIONS - ORC
- ECOSCIENCE CORP/DE
- ESPEY MFG & ELECTRONICS CORP
- EXX INC - CL A
- GENERAL DYNAMICS CORP
- GREENTREE SOFTWARE INC
- GULFSTREAM AEROSPACE
- HEICO CORP
- INNOVIR LABORATORIES INC
- INSTRUMENTARIUM CP - ADR
- JACOR COMMUNICATIONS
- LINDSAY MANUFACTURING CO
- LO JACK CORPORATION
- MAGNEAL-SCHWENDLER CORP
- MINDSPRING ENTERPRISES INC
- NUKO INFORMATION SYSTEMS INC
- ODS NETWORKS INC
- ORACLE CORP
- PERIPHONICS CORP
- PRICE (T. ROWE) ASSOCIATES
- REGENT ASSISTED LIVING INC
- ROCKY MOUNTAIN INTERNET INC
- SECURITY NATL FINL CP - CL A
- SI HANDLING SYSTEMS INC
- SILICON VALLEY RESEARCH INC
- SOURCE MEDIA INC
- TECHNOLOGY RESEARCH CORP
- THERMO TERRATECH INC
- TODD SHIPYARDS CORP
- TRIKON TECHNOLOGIES INC
- UNIT INSTRUMENTS INC
- VICON FIBER OPTICS CORP
- ZOMAX OPTICAL MEDIA INC

Close

Reset Transform



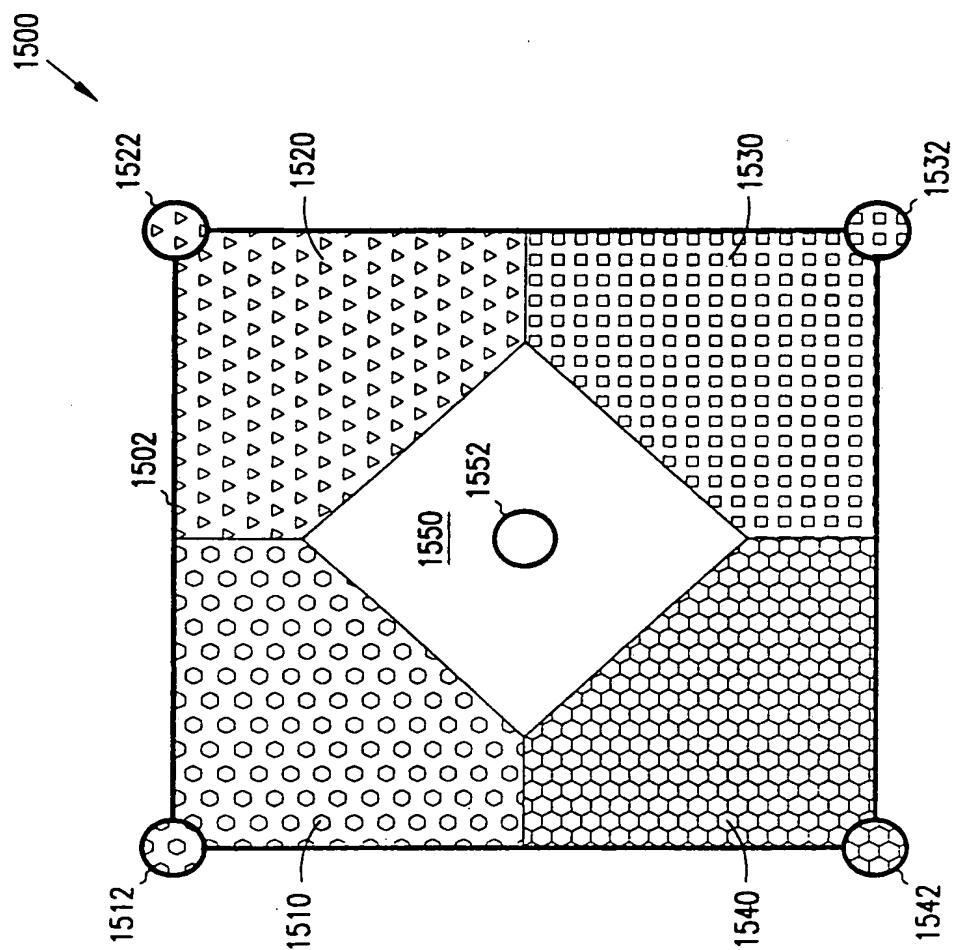


FIG. 15

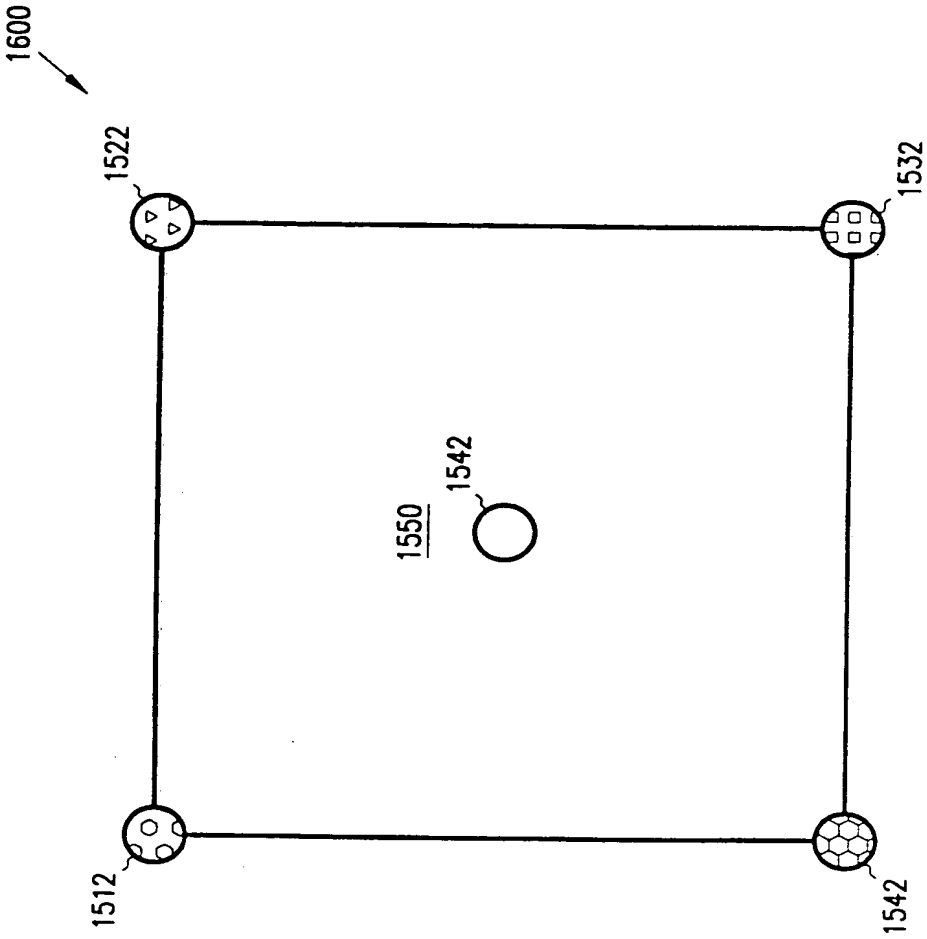


FIG. 16

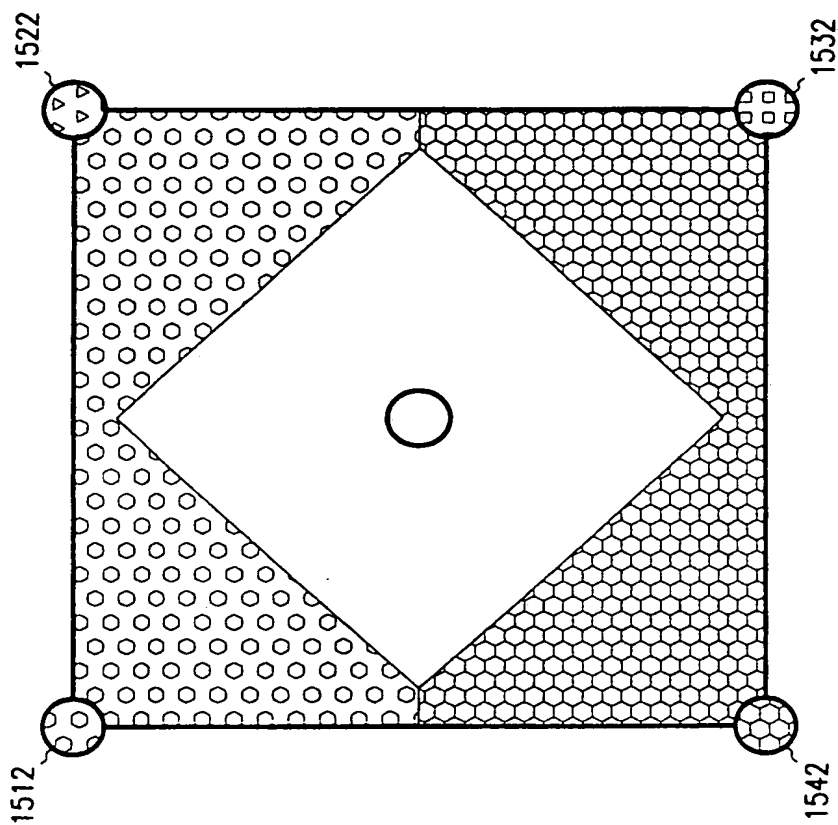


FIG. 17

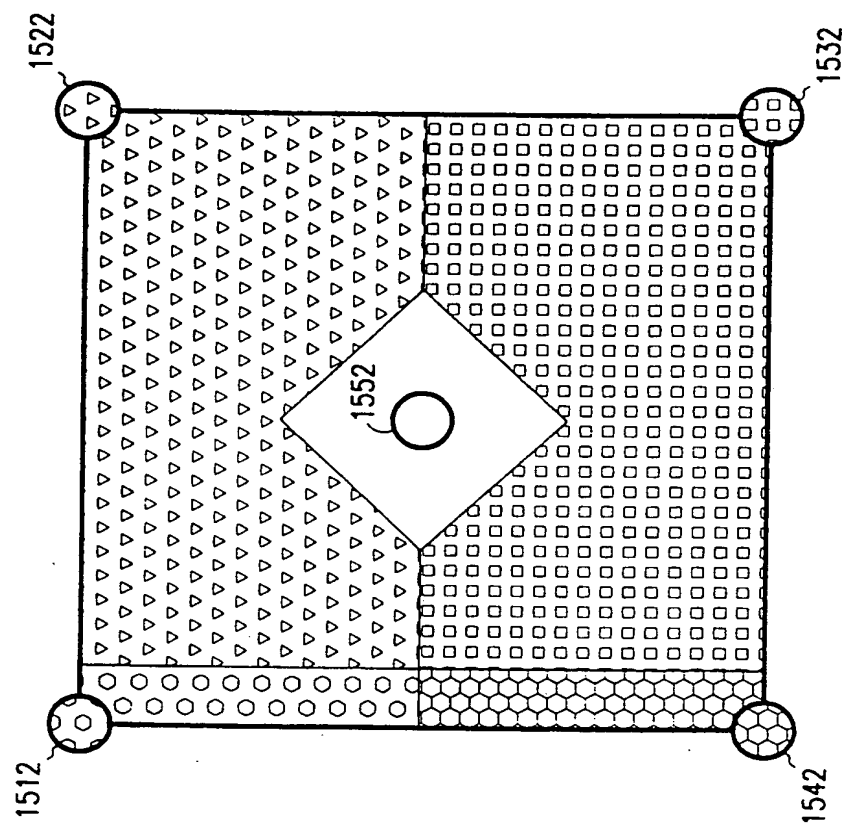


FIG. 18



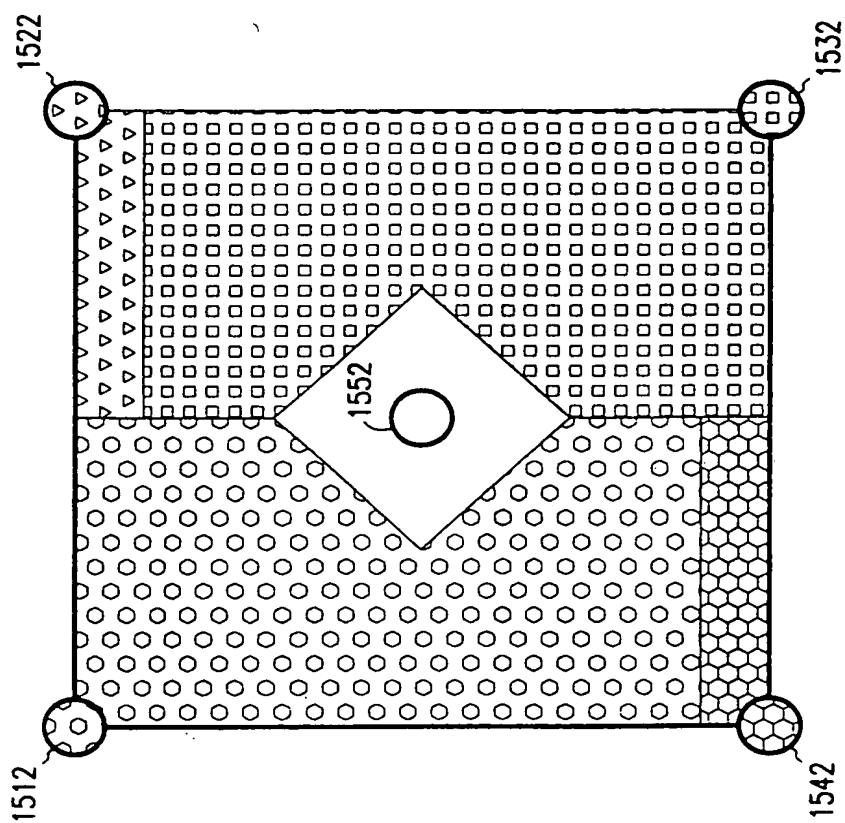


FIG. 19

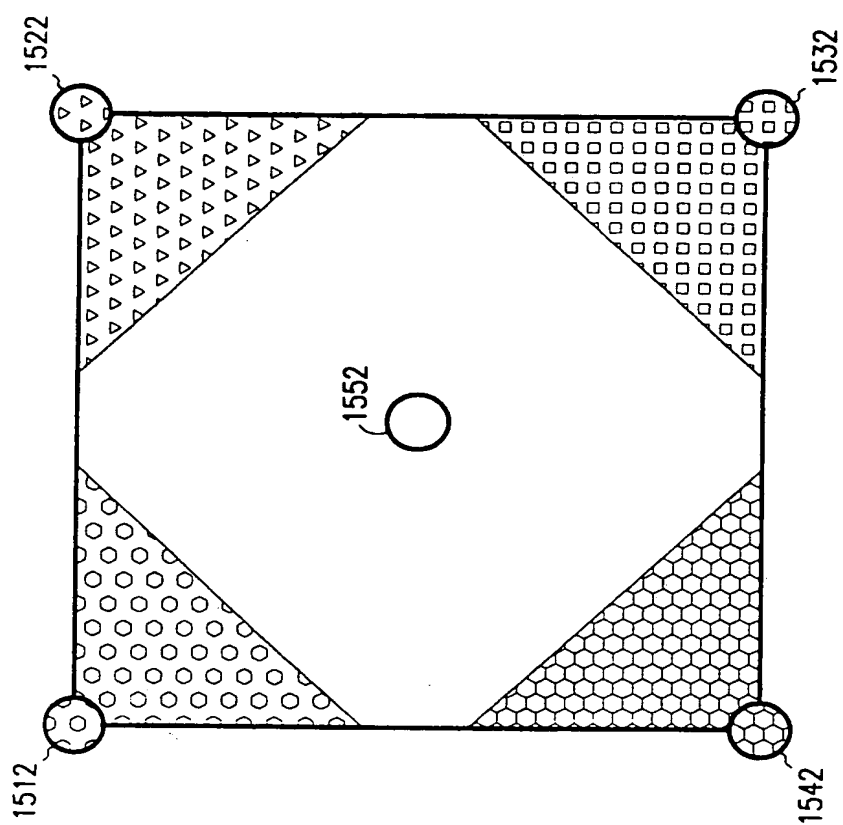


FIG. 20

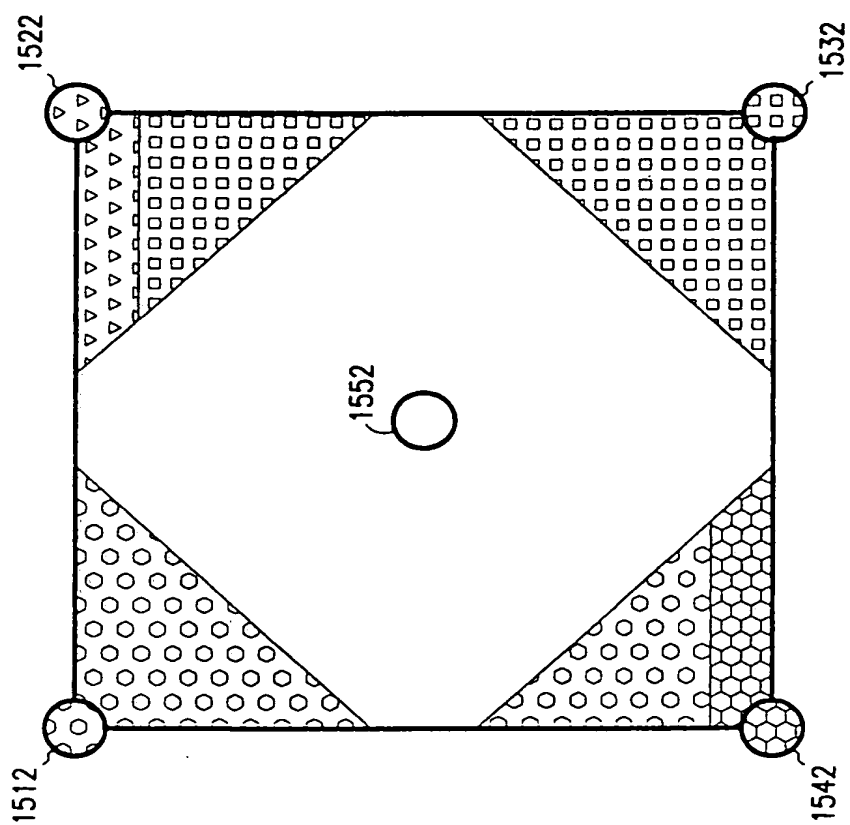


FIG. 21

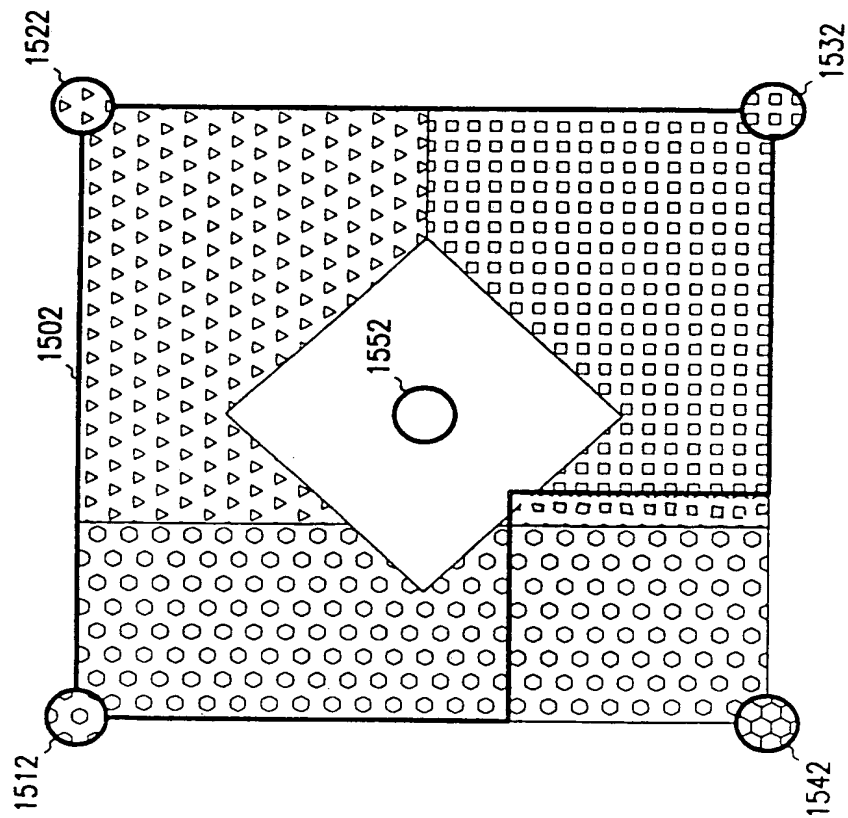


FIG. 22

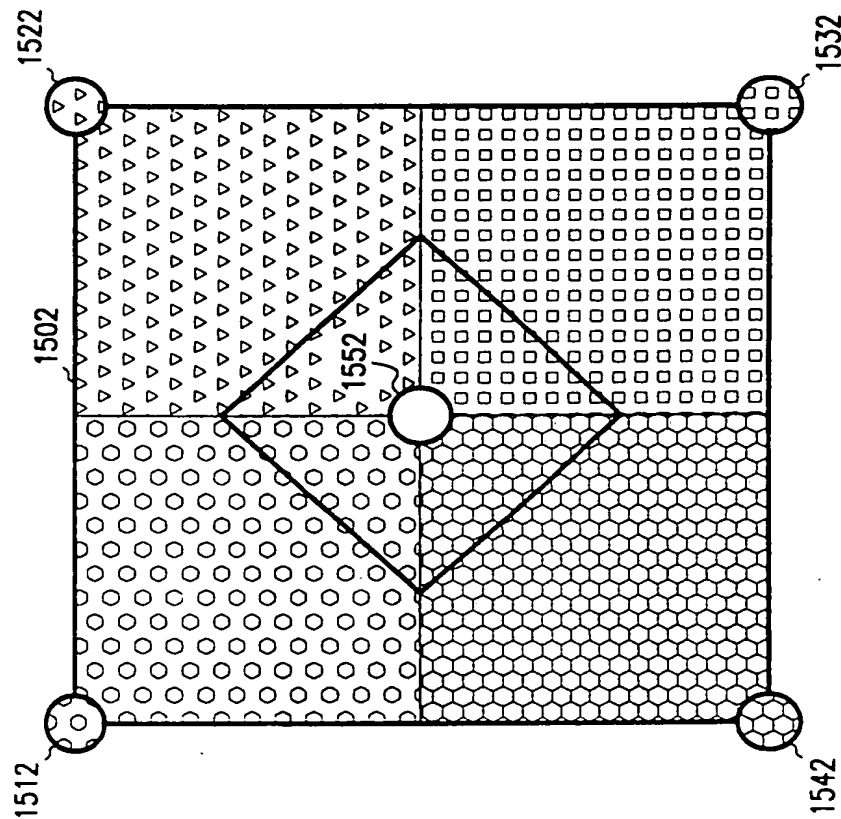


FIG. 23

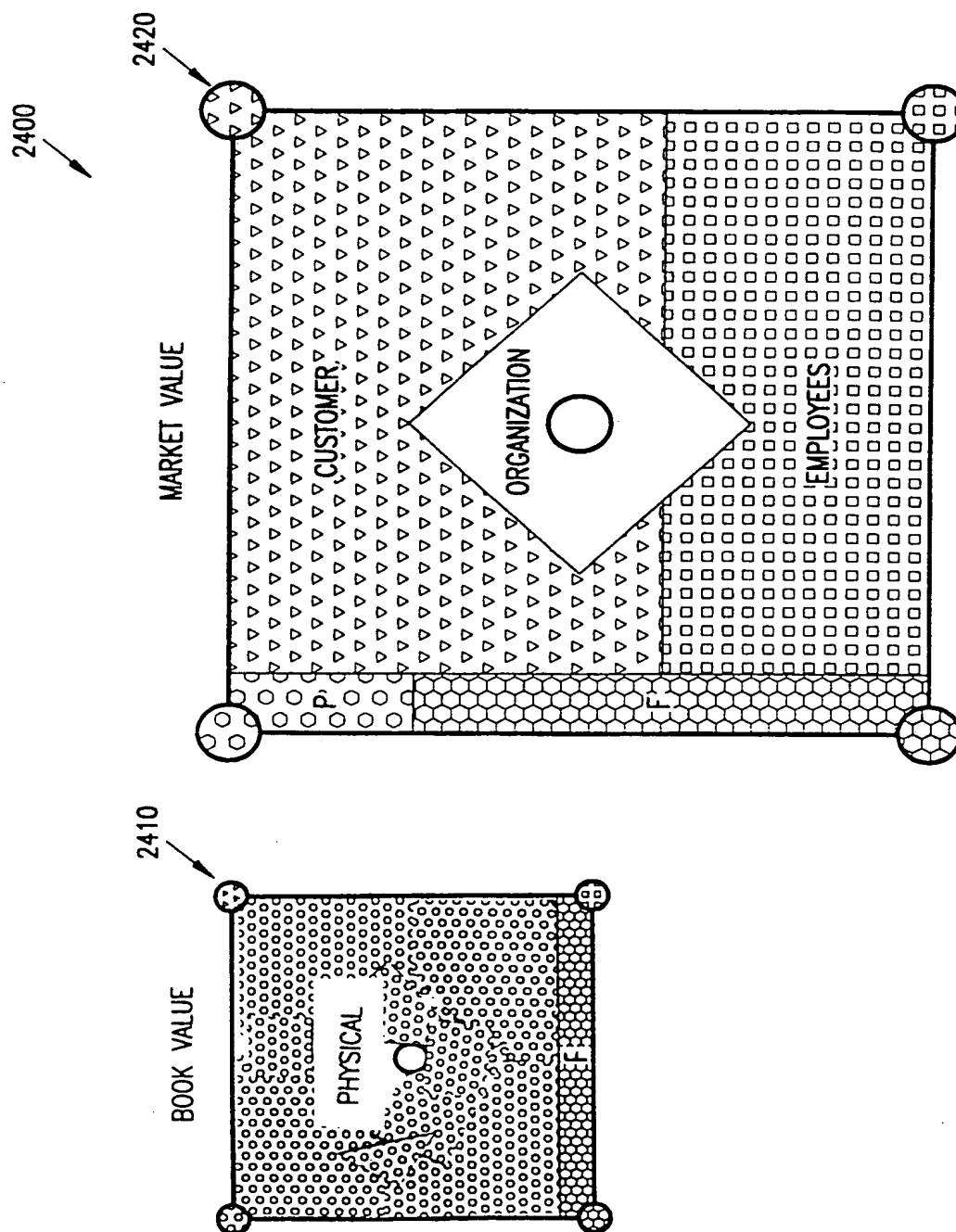


FIG. 24

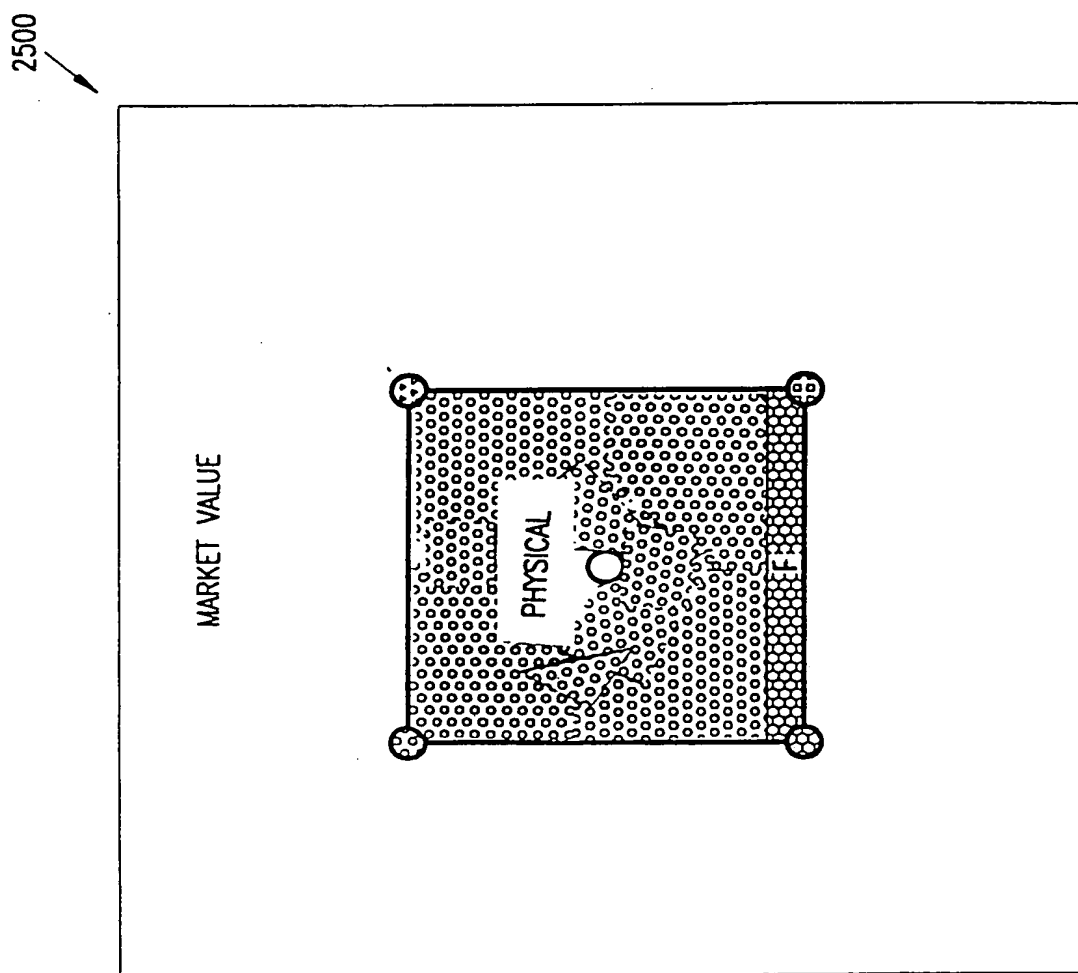


FIG. 25

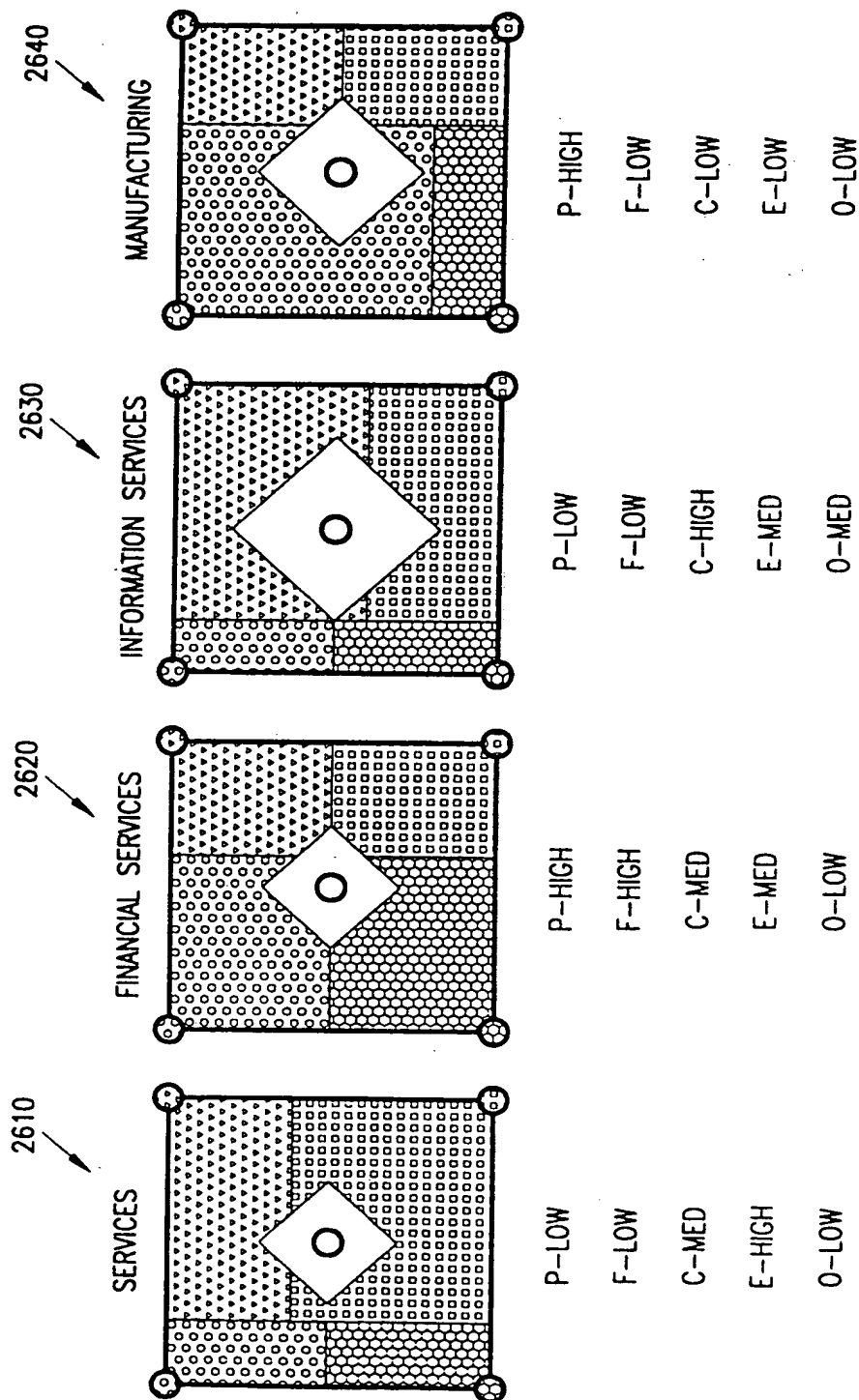


FIG. 26